Registered at the G.P.O. for Transmission to Canada and Newfoundland by Magazine Post.

VOL. 26. Ser. A. Part 4. pp. 185–248. APRIL, 1938.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL INSTITUTE OF ENTOMOLOGY.

LONDON:
THE IMPERIAL INSTITUTE OF ENTOMOLOGY,
41, QUEEN'S GATE, S.W.7.

Price 3s. net.

IMPERIAL INSTITUTE OF ENTOMOLOGY.

Executive Council.

Head Office—British Museum (Natural History), Cromwell Road, London, S.W.7.

Publication Office—41, Queen's Gate, London, S.W.7.

Laboratoires d'Entomologie.—*C. R. Inst. Rech. agron. for. Indochine 1935–36* **1** pp. 71–76, 1 pl. Hanoi, 1937.

A brief survey is given of the investigations in progress in southern Indo-China on insect pests of cultivated plants. In experiments with insecticides, the following were effective : a dust of equal parts of talc and barium fluosilicate against larvae of *Heliothis assulta*, Gn., and *Prodenia litura*, F., on tobacco leaves ; a spray, frequently applied, of nicotine in 3 per cent. kerosene emulsion against *Phyllocnistis citrella*, Stn., on *Citrus* foliage ; and a spray of 3 per cent. vaseline oil (liquid paraffin) emulsified with a paste of coarse rice flour or soft soap against *Lepidosaphes beckii*, Newm., *Parlatoria zizyphus*, Lucas, and *Aonidiella* (*Aspidiotus*) *aurantii*, Mask., on *Citrus*, and *Coccus* (*Lecanium*) *viridis*, Green, *Saissetia* (*Lecanium*) *hemispherica*, Targ., and *Pseudococcus adonidum*, L. (*longispinus*, Targ.) on coffee. *Heterographis bengalella*, Rag., infesting *Anona squamosa* may be controlled by the destruction in late autumn of all the dried fruits, in which pupation occurs.

CARESCHE (L.). **Première note sur les insectes nuisibles au kapokier dans le Sud-Indochinois.**—*C. R. Inst. Rech. agron. for. Indochine 1935–36* **2** pp. 175–194, 8 pls. ; also *Bull. écon. Indochine* **40** fasc. 4 pp. 737–756, 8 pls. Hanoi, 1937.

An account is given of the bionomics of the more important Coleoptera infesting kapok trees in southern Indo-China [*cf. R.A.E.*, A **19** 25], together with descriptions of the species concerned, and brief notes on Rhynchota that have also been observed on kapok. More than 20 species of *Alcides* occur in Indo-China, but *A. obesus*, Faust, appears to be the only one on kapok in the south. It has no alternative food-plant, but as it attacks both wild and cultivated varieties of kapok, it is abundant in the forests and migrates from them to the plantations. The adult weevils appear in May after the first rains. Their numbers are greatest in June, slowly diminish until September, and then rise again for a short time in November. They occur at all times of the day on the ends of the branches or the tops of young plants, feeding on the shoots and causing considerable deformation. They are sluggish in the early morning, but later become very active and readily take flight. The eggs are laid in small cells at the bottom of furrows gouged out by the female near the ends of the branches or even in the stems when they have been topped after an earlier attack. The larvae hatch in 4½–5 days and tunnel in the pith towards the base of the branch or stem, making numerous openings to the exterior for the ejection of frass and causing deformation and delayed growth. Pupation takes place in a cell plugged off from the rest of the larval gallery with frass. Between July and February, under laboratory conditions, the larval, prepupal and pupal periods lasted 100, 66–70 and 12 days, respectively. It is thought that in the field the cycle may be shorter, and that there are probably 2 overlapping generations annually.

Adults of *Desmidophorus breviusculus*, Hbthl., also appear after the first rains, and are common until the beginning of August, when their numbers decrease rapidly. At the end of October, larvae in an advanced instar are abundant, and there may perhaps be a second generation in December and January. The weevils attack cacao

(664) Wt. P9/3656 1,700 4/38 S.E.R. Ltd. Gp. 353 [A]

and the young shoots and particularly the petioles of kapok, causing leaf-fall, and sometimes complete defoliation. At the least movement they drop from the branches, and after windy nights they are abundant on the ground at the foot of the trees. The eggs are laid under dead leaves on loose soil. The larvae are entirely subterranean and feed on the succulent tap-roots of the young kapok plants, eating out deep furrows and sometimes killing them. Sometimes as many as 8 larvae infest the same plant. The lateral roots do not appear to be attacked. Pupation takes place in an earthen cell. It is thought that the life-cycle is completed in 4–5 months.

The adults of *Hypomeces squamosus*, F., attack kapok, cotton, *Hibiscus*, *Citrus*, *Cinchona*, castor, rubber (*Hevea*) and coconut and are common throughout the year, being particularly numerous on kapok towards the end of the dry season. They feed on the leaves, are most active at night and in the early morning and fly readily. The eggs are laid in loose soil rich in organic matter, and the larvae feed on the roots of various plants. Maize is probably one of their preferred food-plants, the seedlings being sometimes severely attacked. The adults of *Astycus lateralis*, F., *Corigetus dejeani*, Faust, and an unidentified weevil, all of which are polyphagous, also sometimes cause appreciable injury to the leaves of kapok.

Methods of control include hand-picking the adults of *Alcides obesus* and *D. breviusculus* in the early morning. The other species are smaller and so more difficult to collect, but can be beaten from the trees and destroyed. In experiments with insecticides against adults of *Alcides*, *Desmidophorus* and *Astycus*, barium fluosilicate was the most satisfactory when cheapness, effect on foliage and persistence were all considered. During the moderately rainy season, it should be applied frequently as a spray, 8 lb. per 100 gals. water with 8 lb. lime, which increases the adhesiveness of the spray. In the dry season, a dust of equal parts of barium fluosilicate and talc may be used. Insecticides are, however, only suitable for nursery plants and small trees. Methods for controlling the larvae include cutting and destroying the affected parts of the plant and the injection of liquid fumigants into the galleries and soil. It is thought that a protective strip, 50–100 yards wide, between the forest and the plantations might be of some use.

Of Coleoptera other than Curculionids infesting kapok, the most important is the Lamiid, *Glenea cantor*, F., which is common in September and October. The eggs are laid in cracks in the bark of the branches of weakened trees. The larvae mine in the superficial tissue, obstructing the flow of sap and sometimes killing the branches. When mature they penetrate the wood, hollowing out a cell in which they pupate. The life-cycle does not exceed 2 months. In vigorous trees the larvae may be killed by the flow of sap, and preventive measures consist in the promotion of strong growth by the use of fertilisers and irrigation. In the early stages of attack, the larvae may be extracted from their galleries ; heavily infested branches should be cut and burnt. Trees already weakened by the attack of *Coptotermes curvignathus*, Hlmgr., are attacked by some large species of Longicorns, which pupate in the wood and cause very severe damage.

Dysdercus cingulatus, F., feeds on the capsules of kapok, but is not very important except where cotton is grown. Freshly moistened seeds of cotton or kapok placed in small heaps are very attractive to the bugs, which swarm on them and may then be destroyed.

Pseudococcus adonidum, L. (*longispinus*, Targ.) sometimes causes serious damage to kapok buds in the nurseries. The tops of severely infested plants should be removed. An attack may be checked in its early stages by spraying with a 3 per cent. oil emulsion.

CARESCHE (L.). **Le termite destructeur de l'hévéa et du kapokier.**— *C. R. Inst. Rech. agron. for. Indochine 1935-36* **2** pp. 195–212, 5 pls., 21 refs. Hanoi, 1937.

In 1922, rubber (*Hevea*) in Cochin China was lightly infested by *Coptotermes curvignathus*, Hlmgr. In 1931, infestation was more severe but still very sporadic, and in 1933 kapok trees were seriously damaged. The alate forms, soldiers and workers of this termite are described. The nests are connected by a system of galleries that vary in depth in the soil, being made nearest to the surface in the rainy season. The chief ones are generally near decaying stumps and in the approximate centre of the area formed by the infested trees. The secondary ones are situated in old stumps of *Hevea* or kapok, or sometimes in those of other trees left after the ground has been cleared. Both primary and secondary nests are connected with alveoli in which fungi are cultivated. Normally *C. curvignathus* feeds on rotting wood, but this may be scarce even in the forests and living trees are then attacked. It is, however, considered that in ground free from woody refuse this termite would be unable to survive.

Rubber and kapok trees may be infested from the tip of the tap-root to a considerable height above the ground. The lateral roots are also attacked, and it seems probable that they are the original site of infestation. Sometimes the termites surround the whole tap-root with an earthen sleeve, which may even encircle the base of the trunk [*cf.* *R.A.E.*, A **25** 97]. Inside this sleeve, they penetrate to the interior of the root or collar, which they furrow with deep longitudinal galleries. The foliage of infested *Hevea* remains perfectly healthy and symptoms of attack are hard to detect. The leaves of infested kapok trees also remain green for some time, but a reddish mucilage is secreted, which accumulates at the foot of the tree, showing that the termites are present. Infestation is seldom confined to one tree.

Control measures, which are discussed in detail, include the injection of insecticidal dusts or gases into galleries in the trees or soil and into the nests. Dusts, however, do not penetrate well into the galleries. Satisfactory control can be obtained with an emulsion of 12 lb. rice flour, 6 lb. soft soap, 4 lb. Paris green, 3½ gals. crude oil and 4½ gals. water diluted for use in 100 gals. water. This should be applied to the infested trees after the bark has been thoroughly cleaned, and forced under pressure into the galleries and on to the roots. Afterwards the ground under the tree should be watered copiously. If the termites in the uppermost galleries in the trees are not affected, a small hole should be made at the top of the infested part and the emulsion or carbon bisulphide injected into it. From 1 to 3 applications of 3–10 pints of emulsion are necessary according to the size of the tree. These have given satisfactory results in rubber plantations, the trees being quite unaffected. With kapok trees, especially those with large lesions, frequent applications sometimes result in necrosis, which is aggravated or even determined by sunlight. Such areas heal rapidly if shaded.

CARESCHE (L.) & NGUYÊN-HUU-HANH. **Toxicité de l'anhydride sulfureux pour les termites.**—*C. R. Inst. Rech. agron. for. Indochine 1935–36* **2** pp. 213–216, 1 pl. Hanoi, 1937.

An account is given of tests carried out in Indo-China of the toxicity of different concentrations of sulphur dioxide to soldiers and workers of *Globitermes annamensis*, Desn., exposed alone and within the earth of a termitarium. The results showed that complete mortality could only be obtained with a minimum concentration, lasting for 15 minutes, of 3 per cent. of the gas. It is thought that it would be almost impossible to maintain this concentration in the complex galleries of *Coptotermes curvignatus*, Hlmgr., the species against which control measures are required, and that the cost would be prohibitive.

HILGENDORFF (G.) & FISCHER (W.). **Ueber die Frostbeständigkeit der Baumspritzmittel (Teerölemulsionen).** [On the Stability of Baumspritzmittel exposed to Freezing.]—*Nachr.Bl. dtsch. PflSchDienst* **17** no. 12 pp. 93–94. Berlin, December 1937.

To ascertain the effect of frost on the tar-distillate spray fluids known in Germany as Baumspritzmittel [*R.A.E.*, A **24** 797, etc.], 19 samples, differing from each other in various respects, were placed in test-tubes in a freezing mixture and kept in a refrigerator for three days, during which the temperature was gradually raised from −22 to −11°C. [−7·6 to 12·2°F.]. On removal, the samples were frozen and more or less disintegrated. They were then thawed and compared, before and after being shaken up and also in 10 per cent. aqueous emulsions, with samples that had been kept at room temperature. In 17 of the 19 samples no important differences from the controls were observed as regards consistency, colour, ease of reduction to a uniform fluidity, time required for this fluid to disintegrate, ease of emulsification, character of the disintegration of the emulsion, and colours observed during such disintegration. Of the remaining two preparations, one, which the maker had stated was not stable to frost, showed marked differences and failed to conform to standard, while the other was affected physically by the treatment, but emulsified more easily after it than before. It is concluded that in general Baumspritzmittel are not qualitatively affected by storage at low temperatures; the only danger is a possible leakage of the container owing to expansion due to freezing. It is desirable that all new preparations should be tested for stability to frost.

A test was also made with 3 heavy oil and 2 medium oil fruit-tree carbolineums [*loc. cit.*]. The only effect of the freezing was that one of the heavy oil preparations showed a slight change in emulsion stability due to the separation of oil droplets. It would, therefore, appear that with fruit-tree carbolineums also the risk of deterioration is slight, provided that they contain no naphthalene, anthracenes or other compounds that crystallise out at low temperatures, or only traces of such substances.

HELM (A.). **Starkes Auftreten von Nadelholzschädlingen in Siedlergärten.** [Severe Infestations by Conifer Pests in a Garden City.]—*Kranke Pflanze* **14** pt. 12 pp. 209–213. Dresden, December 1937.

Notes are given on the bionomics of a number of insects that have recently caused considerable damage to conifers in a garden city in

Saxony near the Naunhof state forest. They comprise *Diprion* (*Lophyrus*) *pini*, L., *D.* (*L.*) *sertifer*, Geoffr., and *Rhyacionia* (*Evetria*) *resinella*, L., on pines, *Pristiphora abietina*, Christ (*Nematus abietum*, Htg.) and unidentified species of *Chermes* on spruce, and *C.* (*Pineus*) *strobi*, Htg., which is abundant on *Pinus strobus*.

PRINCIPI (M. M.). **Contributo allo studio dei Crisopidi più frequenti nell'Umbria.** [A Contribution to the Study of the Chrysopids most common in Umbria.]—*Note Appunti sper. Ent. agrar.* **3** pp. 3–41, 2 figs., 2 pp. refs. Perugia, 1937.

In observations in 1936–37 on Chrysopids in Umbria, the species recorded were *Chrysopa perla*, L., *C. vulgaris*, Schn., *C. prasina*, Burm., and *C. phyllocroma*, Wesm., of which the first was the commonest. Brief descriptions are given of all stages of *C. perla* and of the adults of the other species and an account of their biology, particularly that of *C. perla*, the author's own observations being compared with data in the literature. Eggs of *C. perla* were found irregularly distributed on a variety of plants infested by Aphids, including cabbage and peach. In the laboratory in the summer of 1936, the egg, larval and pupal stages lasted 9–12, 12–30 and 14–16 days, respectively. The larvae, which moulted twice, fed on a species of *Phylloxera* from oak, but preferred APHIDINI, both alate and apterous forms. A larva devoured 90–250 Aphids during its life, or 10–20 a day. An adult in captivity also fed voraciously on Aphids. Winter is passed in the prepupal stage, within the cocoon, and there are probably not more than three generations a year. Coccinellid and Syrphid larvae placed in tubes with Chrysopid larvae did not attack the latter. First-generation eggs were not parasitised, but those collected early in July were parasitised to a considerable extent by *Telenomus acrobates*, Giard. In brief notes on the economic value of Chrysopids, it is stated that they were scarce in Umbria in spring, but were plentiful in June and July, when, with Coccinellids and Syrphids, they destroyed numbers of *Hyalopterus arundinis*, F. (*pruni*, F.) on peach.

CARLINI (L.). **Diffusione e danni di *Contarinia loti* in Val di Chiana e Media Val Teverina.** [The Distribution of and Losses caused by *C. loti* in the Val di Chiana and Media Val Teverina Districts.]—*Note Appunti sper. Ent. agrar.* **3** pp. 75–86, 3 figs. Perugia, 1937.

For some years past, injury to the inflorescences of lucerne in Umbria, with consequent losses of seeds amounting to 30 per cent. in some localities, has been caused by a Cecidomyiid that has been identified as *Contarinia loti*, DeG. [but *cf. R.A.E.*, A **22** 494]. After feeding in the flowers for 10–12 days, the larvae drop to the ground and pupate just below the surface 3–4 days later. The adults emerge after about 10 days. Captive adults lived for a week. In breeding experiments, larvae pupated normally in damp soil, but died in dry soil. There were 3 generations a year, the adults emerging at the end of May, in mid-July and in late August or early September. Winter is passed in the pupal stage. In nature, the generations overlap. Females bred in jars contained no mature eggs, whereas those caught in the field contained numerous normally developed eggs, so that it would seem that they require food and time for egg maturation. Pairing appeared to occur chiefly in the early morning, and oviposition

during the hot hours of the day. The attack causes abortion of the flowers, so that no seed-pods are formed. After the larvae have left, the flowers wither and drop easily. Infestation is favoured by a combination of moisture and warmth; it is less severe on hills, almost absent on poor, arid soil, and greatly reduced by a hot, dry summer. Artificial control may be obtained by a combination of early harvesting, harrowing, and treating the soil with lime or calcium cyanamide. The ideal would be to sow lucerne in rows, when cultural methods might be employed to expose the larvae and pupae in the soil. The disadvantage of coarse fodder entailed by sowing in rows could be obviated by early cutting.

Report of the Forest Products Research Board for the Year 1936.— Med. 8vo, 76 pp., 4 pls., 6 figs., refs. London, H.M.S.O., 1937. Price 1*s.* 6*d.*

Part of this report (pp. 37–42) deals with research connected with wood-boring insects. In an experiment on a semi-commercial scale on the removal of starch from green timber by moist heat treatment, in an attempt to render it immune from infestation by *Lyctus* [*cf. R.A.E.*, A **25** 494], a small load of green 1-inch oak and ash boards containing an abundance of starch was kept for a month in a kiln at 39°C. [102·2°F.] and 95 per cent. relative humidity. This treatment, however, sufficiently reduced the starch only in parts of the boards. In laboratory tests of wood preservatives [*cf.* **25** 51], samples of oak sapwood were immersed for 5 minutes in aqueous solutions of 5 per cent. zinc chloride, sodium fluosilicate, borax or potassium chromate, or 3 per cent. sodium fluoride. Two months later the samples were exposed to *Lyctus*, and none was immune. It is thought that, owing to the very superficial penetration, aqueous solutions would be effective only if applied by pressure impregnation. A 20 per cent. solution of a chlorinated naphthalene wax in benzene gave protection when similarly tested.

Experiments carried out in co-operation with the National Physical Laboratory have shown that hydrogen, sulphur dioxide and carbon dioxide penetrate wood with sufficient rapidity to suggest that hydrocyanic acid gas might be successfully used for fumigation of furniture, and also, possibly, of buildings of easily penetrated material. This gas is, however, retained in wood with some tenacity, and direct experiments are necessary to determine how far it may be used without fear of its subsequent release in dangerous quantities. The presence of exit holes in the surface of infested timber may materially aid penetration, and this is supported by two experiments in which wood infested by *Lyctus* was treated with HCN in a fumigation chamber. In the first test some of the larvae were not killed, but modifications in the second gave satisfactory results. Larvae of *Lyctus* and samples of wood containing larvae of various wood-boring insects were exposed to X-ray treatments, but none of the insects was killed. The experiments, however, confirmed previous indications that X-ray photography might be useful for detecting insects in thin pieces of valuable wood. Infestation by *Lyctus* was observed in the walnut panelling of a liner and caused serious damage in several large consignments of plywood faced with Japanese oak.

Further studies on the bionomics of *Xestobium rufovillosum*, DeG., showed that a moisture content of 16–20 per cent. in decaying timber

is more suitable for the development of the larvae than one of 10–16 per cent., and that one of 8 per cent. or less in similar wood is unsuitable. In severely decayed wood, with a moisture content of 20 per cent., kept at 25°C. [77°F.], the life-cycle was completed in 1–2 years [*cf.* **25** 494].

Three instances were observed of the occurrence of *Schistoceros hamatus*, F., in the sapwood of American oak. In the United States, this Bostrychid is known to attack the twigs of various trees, but does not appear to have been recorded as a borer in timber. Examination of wood of a silver fir [*Abies*] heavily infested by *Sirex cyaneus*, F., showed no important difference between the fungus association of this species and that of *S. gigas*, L. [**19** 73]. Two instances of damage by the house Longicorn, *Hylotrupes bajulus*, L., have been investigated.

PETHERBRIDGE (F. R.) & THOMAS (I.). **Spraying for Plum Sawfly : with Notes on Red Spider and Thrips.**—*J. Minist. Agric.* **44** no. 9 pp. 858–865, 5 refs. London, December 1937.

Experiments were carried out in eastern England in 1937 to test the relative values of quassia and derris in sprays against *Hoplocampa flava*, L., on plum. On 10th May, when the receptacles were beginning to split, blocks of damson and plum in one orchard were treated with sprays of 13 oz. derris with 3 oz. sulphonated lorol, 13 oz. derris with 3·2 pints of an emulsion containing 83 per cent. by volume summer oil, or 12 lb. quassia with 1 lb. soft soap, each in 40 gals. water. The soft soap was dissolved in well water and the quassia chips soaked for 3 days in the solution, which was then strained and diluted to 40 gals. On 2nd June, the percentages of plums infested by *H. flava* were 33 on control trees and 6·6, 3·1 and 0·3, respectively, on those sprayed with derris and sulphonated lorol, derris and oil, and quassia. Of damsons, the corresponding percentages were 19·7, 5·7, 1·4 and 0·1. In a second experiment in another locality, plum trees were treated with the same three sprays when the receptacles were beginning to split on 14th May. On this occasion the quassia chips were soaked for 7 days in the soap solution. Each treatment was duplicated. The percentages of plums infested on 2nd June were 15·2 and 16·1 on the unsprayed trees, and 5·2 and 5·9, 2·3 and 3·3, and 1·4 and 1·5, respectively, on those sprayed with derris and sulphonated lorol, derris and oil, and quassia. In both experiments the crops on the trees were very light and strict comparison was not possible. Although quassia gave the best control, derris and oil was the only one of the three sprays to bring about appreciable reduction in the numbers of *Paratetranychus pilosus*, C. & F. (*Oligonychus ulmi*, auct.) and *Taeniothrips inconsequens*, Uzel, against which the trees had not received the usual spray of lime-sulphur. Infestation by *P. pilosus* increased rapidly and caused considerable browning of the leaves ; trees treated with derris and oil were noticeably greener than any others on 9th–12th July, but some of them became as severely infested later as those in neighbouring control plots. In the second experiment, 50 per cent. of the plums on trees sprayed with derris and oil were marked by *T. inconsequens* while on control trees and those subjected to other treatments about 95 per cent. were marked. The quassia spray, in making which the chips should be soaked for at least 24 hours, is therefore recommended for infestations of *H. flava* only, but where *P. pilosus* or

T. inconsequens are also present the spray containing derris and oil is likely to give a better crop. All sprays should be applied at the time that the receptacles are splitting.

PAILLOT (A.). **Caractères du cycle évolutif du carpocapse dans la région lyonnaise. Méthodes de lutte.**—*C. R. Acad. Agric. Fr.* **23** no. 31 pp. 991–995, 1 ref. Paris, 1937.

Observations on the codling moth [*Cydia pomonella*, L.] near Lyons were continued in 1937 [*cf. R.A.E.*, A **25** 67]. Pupation, which in 1934 had begun in mid-April and in 1936 had mostly taken place by the beginning of that month, was not observed in the trap-bands until the end of April. The average monthly temperatures for the period October–May in these years are tabulated, and it is concluded that the onset of pupation depends mainly on the average temperature in March, and that the length of the pupal stage also depends on temperature and not on the date of pupation. It has been observed that overwintered larvae from pear give rise to adults earlier than those from apple, and the latter earlier than those from walnut. Larvae from apple and walnut taken in trap-bands in July 1936 and kept out of doors through the winter gave rise to adults that emerged from 24th May to 22nd July and from 2nd June to 9th August, respectively.

The percentage of first-generation larvae that pupated in bands on apple and pear and gave rise to adults during the summer was 20 [*cf. loc. cit.*]. Emergence of these adults lasted from 26th July to 7th August. The importance of the second-generation larvae on apple and pear is considerable; they also occur on walnut, but in much smaller numbers.

Recommendations for control [*loc. cit.*] are repeated; trap-bands should be applied against the second-generation larvae.

[POLIZU (S.)] **Полизо (С.). The Parasite of the Woolly Aphis in Bessarabia and Bukovina.** [*In Russian.*]—*Bessarabsk. s.-kh. Vyestn.* 1937 no. 6 pp. 7–9, 2 figs., 1 ref. Chisinau, December 1937.

An attempt to introduce *Aphelinus mali*, Hald., into Rumania in 1923 was unsuccessful, but as it was found in Moldavia in 1934 [*R.A.E.*, A **24** 791], it seemed likely that it might occur naturally in adjoining parts of Rumania. Investigations were therefore carried out in 1936 and 1937, and it was found to be parasitising a high percentage of *Eriosoma lanigerum*, Hsm., on apple in various districts, both in Bessarabia and Bukovina, the Aphid being consequently a less serious pest there than it had been in the past. It is possible that the parasite reached Bessarabia by gradually migrating down the Danube from Jugoslavia [*cf.* **20** 316]. Notes on its biology are given, and the adult is briefly described.

DOBREANU (E.). **Contribuţiuni la studiul sistematic, morfologic şi biologic al insectelor miniere din România.**—Med. 8vo, 128 pp., 69 figs., 1 col. pl., 76 refs. Bucharest, Fac. Ştiinte, Lab. Zool. 1937. (With a Summary in French.)

Sections of this paper comprise an introductory review of the biology of leaf-mining insects and the types of mines they make;

an account of the bionomics of *Lithocolletis populifoliella*, Tr., a severe outbreak of which was observed on poplar in Bucharest in 1932 ; detailed descriptions of the larval morphology of this and nine other species of leaf-mining Lepidoptera that occur in Rumania ; a comparison of the mouth-parts of the larvae of mining insects of different orders ; and a list (arranged alphabetically under genera) of plants found attacked by mining insects in Rumania, showing the insects concerned, the characters of their mines, and the localities in which they were taken.

Manolache (C. I.). **Cercetari cantitative asupra macrofaunei frunzarului de *Larix* (Valea Zgarburei–Sinaia) şi stejar (Căscioare–Vlaşca).** [Quantitative Studies of the Macrofauna of the Litter of Larch (near Sinaia) and of Oak (in Căscioare in the Province of Vlashka).]—Med. 8vo, 134 pp., 6 figs., 19 graphs (4 fldg.), 81 refs. Bucharest, Inst. Cercet. agron., 1937. (With a Summary in German.)

A detailed account is given of the results of investigations on the macrofauna of the litter in stands of larch and oak in Rumania. Mites and Collembola, constituted 84·10 and 13·79 per cent., respectively, of the total fauna in the larch litter and 72·61 and 20 per cent. in the oak litter, these figures representing the mean yearly prevalence. The abundance of the population in the litter was greatly affected by temperature and humidity ; a decrease in the latter often resulted in a reduction in the numbers of Collembola, whereas the mites increased. There was no apparent relation between the pH of the litter and the abundance of the populations.

Van den Brande (J.). **Le hannetonnage en Campine limbourgeoise.**—*Bull. Soc. for. Belg.* **43** no. 9 pp. 372–379, 1 pl. Brussels, September 1936. [Recd. December 1937.]

For a number of years, pine stands in a district of the Campine (north-eastern Belgium) have been severely infested by larvae of *Melolontha hippocastani*, F. The damage to young stands renders reafforestation almost impossible, older trees are also seriously attacked, and cleared land carries a large population. In the infested area, the life-cycle lasts four years, adults appearing in leap-years. The soil is sandy and dry, so that the entomogenous fungus, *Botrytis tenella*, which is often of importance in the natural control of this Melolonthid, does not occur there.

Organised collection of the adult cockchafers, of which an account is given, was carried out over an area of about 250 acres in May 1936. The beetles were beaten from the trees on to sheets in the morning, when they are inactive ; it is estimated that about 5 million, or some 80 per cent. of the total population, were thus destroyed.

Weidner (H.). **Termiten in Hamburg.**—*Z. PflKrankh.* **47** pt. 12 pp. 593–596, 3 figs., 4 refs. Stuttgart, 1937.

In February 1937, damage by *Reticulitermes flavipes*, Kollar, to boards in a conduit of the municipal heating system was observed in Hamburg. All but a few of the infested boards found had been replaced before full investigation could be made. The occurrence of this termite is regarded as serious, as a temperature of 40–50°C.

[104–122°F.] obtains throughout the year in the conduits, which contain a considerable amount of timber. The origin of the infestation has not been ascertained.

SCHWERDTFEGER (F.). **Ueber den Einfluss des Lebensraumes auf den Maikäfer.** [On the Influence of the Amount of Space on Melolonthid Beetles.]—*Z. PflKrankh.* **47** pt. 12 pp. 603–612, 9 refs. Stuttgart, 1937.

The following is taken from the author's summary of experiments in which adults of *Melolontha hippocastani*, F., were confined in batches of from 8 to 200 in jars or cages of different dimensions, so as to allow each individual 222, 234, 938, 3,908 and 59,225 cc.: The amount of space did not affect the average longevity of a population. Reduced space somewhat increased the frequency of mating, but reduced the amount of food consumed per individual in a given time, the number of eggs per female, the average weight of the newly laid eggs, the percentage that hatched and the weight of the larvae on hatching. It is therefore necessary to give consideration to the effect of space in all experiments involving confinement in cages.

NEUMANN (H.). **Ueber ein schädliches Massenauftreten von *Maladera holosericea* Scop.** [On an Outbreak of *M. holosericea*.]—*Z. PflKrankh.* **47** pt. 12 pp. 613–619, 5 figs., 5 refs. Stuttgart, 1937.

Serious injury to the leaves of many vegetables and other plants in an agricultural settlement on waste land near Lübeck was reported in April 1937. The ground was drilled with almost vertical holes about $\frac{1}{4}$ in. in diameter, nearly every one of which contained an adult of the Melolonthid, *Maladera holosericea*, Scop. [*cf. R.A.E.*, A **24** 79]. Cultivation of the land found most heavily infested had only begun in the spring of 1937. The beetles, which were especially numerous in spots where peat compost had been mixed into the very light, sandy soil, left the ground and fed on plants in the evening, 30–38 and 11–18 individuals per plant being observed on rhubarb and strawberry, respectively. Young plants, especially strawberry, were quite defoliated and died. In adjoining uncultivated ground, injury was confined almost exclusively to grasses. In feeding experiments, onion was refused and lettuce was refused if grasses were also offered. Fruit bushes and almost all the other vegetables were preferred to grasses. In attempts to control the beetles, pyrethrum and derris dusts and sprays of arsenicals and tar distillates (fruit-tree carbolineums) gave no result. Preparations containing o-dinitro-cresol were effective in the laboratory, but cause too much scorching of the plants to be practicable.

RIECHEN (F.). **Die bislang in der Rheinprovinz festgestellten Material-, Speicher-, Vorrats- und Wohnungs-Schädlinge unter den Käfern.** [The Coleoptera injurious to Materials, Storehouses, Provisions and Dwellings hitherto recorded in the Rhine Province.]—*Decheniana* **95B** pp. 83–112. Bonn, 1st October 1937.

This list comprises upwards of 130 species, arranged by families, the localities where each was found being recorded, with, in most cases, a brief note on the infestation, and, in some, a reference to information in Zacher's text-book [*R.A.E.*, A **15** 570].

Schuch (K.). **Experimentelle Untersuchungen über den Einfluss von Temperatur und Feuchtigkeit auf das Wachstum der Hausbockkäferlarven.** [Experimental Investigations on the Influence of Temperature and Humidity on the Growth of Larvae of *Hylotrupes bajulus*.]—*Z. angew. Ent.* **24** pt. 3 pp. 357–366, 3 graphs, 8 refs. Berlin, November 1937.

In two parallel experiments each lasting 96 days, small and large larvae of *Hylotrupes bajulus*, L., all 5 months old, were placed in batches of 5 on pine slabs of outer sapwood, including a portion of the last annual ring, but without the bark [*cf. R.A.E.*, A **26** 91]. The growth of the larvae was observed at temperatures of 17, 21, 24 and 28°C. [62·6, 69·8, 75·2 and 82·4°F.]. and relative air humidities of 50–56, 70–78, and 80–90 per cent. The results, which are given in tables and graphs, show that growth at a given temperature increases with a rise in humidity, and at a given humidity with a rise in temperature. In an experiment at room temperature (averaging 18·8°C. [65·84°F.]) and four different humidities, newly hatched larvae were placed in batches of 5 on slabs similar to those of the previous tests. After 267 days, 5 slabs, kept at 34 per cent. humidity had a water content of 7·5 per cent. and had only been slightly attacked ; they harboured some dead but no living larvae, so that it is assumed that all had died. In 5 slabs kept at 56 per cent. humidity, 19 larvae (with an average weight of 1 mg.) out of the 25 were alive. At both 78 and 99 per cent. humidity, 23 larvae were alive, the respective average weights being 3·4 and 3·9 mg. Two of the 5 slabs kept at 99 per cent. humidity were attacked by mould and the larvae in them were very backward in growth.

Larval growth was several times as rapid at 28°C. as at 17°C. ; in Germany, such favourable temperatures as the former occur in summer in attics, particularly in those roofed with good conductors of heat, such as slate [*cf.* **19** 379].

Herzig (J.). **Ameisen und Blattläuse. (Ein Beitrag zur Oekologie aphidophiler Ameisen.)** [Ants and Aphids. (A Contribution to the Ecology of aphidophilous Ants.)]—*Z. angew. Ent.* **24** pt. 3 pp. 367–435, 18 figs., 4 pp. refs. Berlin, November 1937.

A detailed account is given of a study in Germany of the ecology and relations to Aphids of the ants, *Lasius niger*, L., *L. fuliginosus*, Latr., and *L. brunneus*, Latr., which are indigenous, and *Iridomyrmex humilis*, Mayr, an introduced species found in greenhouses. The Aphids were *Aphis sambuci*, L., *Aphis* (*Doralis*) *fabae*, Scop., *Periphyllus testudinatus*, Thornt., *Aphis pomi*, DeG., and *Macrosiphum rosae*, L. The work was done mainly in the field, but partly in artificial nests.

The following is taken from the author's summary : The species of ants studied here do not distribute the young Aphids on the plants in spring, but seek out the new colonies founded by the stem-mothers that hatch from the overwintered eggs. They do not intentionally protect the Aphids, but merely react to swift moving bodies and regard any attack on the Aphids as directed against themselves. They seldom disturb the sluggish Coccinellid larvae and adults preying upon Aphids. They frequently transport Aphids in summer, but only downwards to their nests ; in all observed cases, the Aphids were dead and were evidently intended for food. The injury to plants due

to the association of ants and Aphids is less noticeable in the plants themselves than in the reduced yield, which may be halved if the ants "milk" the Aphids close to the blossoms and drive away the pollinating insects. *Lasius niger* is in this way a serious pest in vegetable gardens.

LEHMENSICK (R.) & LIEBERS (R.). **Die Oberflächenstruktur von Motteneiern als Bestimmungsmerkmal.** [The Surface Structure of the Eggs of Moths as an Identification Character.]—*Z. angew. Ent.* **24** pt. 3 pp. 436–447, 8 figs., 2 pls., 10 refs. Berlin, November 1937.

Descriptions and figures are given of the surface structure of the eggs of *Tineola biselliella*, Humm., *Aphomia gularis*, Zell., *Pyralis farinalis*, L., *Plodia interpunctella*, Hb., *Ephestia kuehniella*, Zell., *E. elutella*, Hb., and *E. cautella*, Wlk.

WEIDNER (H.). **Bestimmungstabellen der Vorratsschädlinge und des Hausungeziefers Mitteleuropas.** [Keys to the Store Pests and Household Vermin in Central Europe.]—Med. 8vo, xvi + 144 pp., 171 figs. Jena, G. Fischer, 1937. Price paper *M.* 6·50, cloth *M.* 7·70.

The bulk of this work (pp. 8–124) consists of a key to the various Arthropods, their identification being based on morphological characters, supplemented in some cases by notes on habitat or food. For wood-boring pests there is an additional key (pp. 125–131), based on the character of the injury. Indices are given to the scientific and popular names of the pests, and to their characteristic habitats and food-stuffs.

SCHWERDTFEGER (F.). **Ueber Genauigkeit und Arbeitsaufwand bei prognostichen Untersuchungen.** [On the Accuracy in Investigations for the Purpose of making Forecasts and the Labour involved in them.]—*Anz. Schädlingsk.* **13** pt. 12 pp. 141–144, 2 graphs. Berlin, December 1937.

The author discusses the number of examples of an insect that must be examined to determine, with reasonable accuracy in relation to the time spent in investigation, such characteristics as sex-ratio, percentage of parasitism or average weight. He bases his argument on the results of examining 800 pupae of *Panolis flammea*, Schiff., together and in batches of from 20 to 600, showing the degree to which errors increase with a decrease in the size of the batch examined and the calculations involved. He concludes that it is sufficient to examine 100 individuals.

GÄBLER (H.). **Die Bedeutung einiger Blattlausfeinde.** [The Importance of some Enemies of Aphids.]—*Anz. Schädlingsk.* **13** pt. 12 pp. 148–150. Berlin, December 1937.

This is a record of observations in Germany in the spring of 1937 on the destruction of Aphids by insect predators. Larvae observed preying on Aphids on hawthorn (*Crataegus*) were tested in the laboratory, where the maximum numbers of Aphids killed in a day were 100 by a full-grown *Chrysopa* larva and by a Syrphid larva 8·5 mm. long,

70 by a full-grown larva of *Anatis ocellata*, L., and by a Syrphid larva 3·5 mm. long, and 50 by a much smaller larva of *Adalia* (*Coccinella*) *bipunctata*, L. Owing to their greater abundance in nature, Syrphid larvae were much more important predators than *A. ocellata*. Adult predators observed in the field, in order of importance, were Coccinellids, bugs and Telephorids.

Aczél (M.). [**Investigations on Pyrethrum.**]—*Mitt. ungar. Gartenb.-Lehranst.* **3.** (Abstr. in *Anz. Schädlingsk.* **13** pt. 12 pp. 150–151. Berlin, December 1937.)

An account is given of experiments in Hungary on the adhesive properties of pyrethrum powder and on its dilution. By using an apparatus similar to those of Görnitz and Voelkel [*R.A.E.*, A **15** 646; **17** 641], it was found that an admixture of talc increased the adhesiveness of the powder, while one of kaolin did not. Microscopic examination of a mixture of equal parts of pyrethrum and talc, thoroughly ground together, showed that the heavy particles of talc anchored the very light particles of pyrethrum.

Tests on *Calandra granaria*, L., by a modified form of Götze's method [**20** 443] showed that pyrethrum cannot be diluted with kaolin without loss of efficiency. At moderate dilutions with talc, however, its efficiency was increased, owing to the increased adhesiveness of the mixture. A good quality pyrethrum diluted with talc to 10 per cent. and a poor quality diluted to 50 per cent. were very effective against *C. granaria* and *Bruchus* (*Acanthoscelides*) *obtectus*, Say. *Phytodecta fornicata*, Brügm., *Subcoccinella vigintiquatuorpunctata*, L., *Bruchus pisorum*, L., flea-beetles, flies and wasps were killed almost as quickly as *B. obtectus*, which should therefore be useful as a test insect. In field experiments, pyrethrum-talc proved effective against various pests, including flea-beetles on flax, rape and beet and *Meligethes aeneus*, F., on rape.

Parsons (F. S.). **The Constitution of Nectar secreted by the extrafloral Glands of Cotton—a natural Food of the Bollworm Moth,** *Heliothis armigera* **Hubn.**—*Proc. R. ent. Soc. Lond.* (A) **12** pt. 10–12 pp. 151–154, 9 refs. London, 15th December 1937.

Analysis of cotton nectar, which is freely imbibed by adults of *Heliothis armigera*, Hb., in the field, showed that it contained 32 per cent. reducing sugars (glucose and fructose and a minute quantity of mannose), 1·36 per cent. sucrose, traces of potassium and sodium as chlorides and probably some acid potassium oxalate, and 66 per cent. water.

Morris (K. R. S.). **The prepupal Stage in Ichneumonidae, illustrated by the Life-history of** *Exenterus abruptorius*, **Thb.**—*Bull. ent. Res.* **28** pt. 4 pp. 525–534, 4 figs. 3 refs. London, December 1937.

The following is the author's summary: A full description is given of the life-history of *Exenterus abruptorius*, Thnb. (*cingulatorius*, Hlmgr.), an important parasite of the pine sawfly, *Diprion sertifer*, Geoffr. The insect is univoltine, like the host. It oviposits on the last stage larva or prepupa and only hatches after the host has spun its cocoon. Only one-quarter of the primary larvae develop immediately,

the remainder resting up to two and a half months during the summer before proceeding with their development. On the completion of feeding the parasite larva spins its cocoon within the host cocoon and enters the prepupal stage, which can be divided into two distinct phases, eonymphal and pronymphal. Hibernation is always in the eonymphal stage. In Sweden 37 per cent. of this species remained in hibernation for two winters, but in Hungary all emerged in the spring following the year of development. Further than this, in Sweden the sexes were in approximately equal proportions ; in Hungary females exceeded males by four to one. This may indicate the existence of biological races.

Other ICHNEUMONIDAE exhibit the prepupal stage, with eonymphal and pronymphal phases, in their development. The typical facies of this is analogous to that in the prepupal stage in the TENTHREDINIDAE, in which, however, ecdysis precedes this stage, which is then a distinct instar. It is suggested that an instar is lost in the development of the ICHNEUMONIDAE, though the facies of the prepupal stage is retained.

MILLER (N. C. E.). **A new Genus of Malayan Capsidae (Rhynchota) from Areca Palm.**—*Bull. ent. Res.* **28** pt. 4 pp. 535–537, 2 figs. London, December 1937.

Descriptions are given of the egg, fourth-instar nymph and adults of both sexes of *Parasthenaridea arecae*, gen. et sp. n., a Capsid commonly occurring on the inflorescence of *Areca catechu* in Malaya. In laboratory experiments, both nymphs and adults appeared to feed exclusively on the flower-stalks. The eggs are deposited under the calyx of the female flower, either singly or in batches of up to 9. They are at first invisible, but after hatching the empty and flattened chorion protrudes from under the calyx.

MAXWELL-DARLING (R. C.). **The Outbreak Areas of the Desert Locust** (*Schistocerca gregaria* **Forsk.) in Arabia.**—*Bull. ent. Res.* **28** pt. 4 pp. 605–618, 1 pl., 1 map, 7 refs. London, December 1937.

The results are given of a survey of possible outbreak centres of *Schistocerca gregaria*, Forsk., in central and southern Arabia, carried out in 1935 and 1936 in continuation of similar work in the Anglo-Egyptian Sudan [*R.A.E.*, A **22** 262 ; **24** 231, 232]. Attention was concentrated on areas that were sandy, with perennial grasses and undershrubs, and in which conditions characteristic of outbreak centres were likely to be encountered [*cf.* **24** 231]. The types of country and vegetation and the climatic conditions in the areas surveyed are briefly described. The southern part of the Red Sea coast of Saudi Arabia, where numerous solitary locusts were met with, consists of a sandy plain across which run water-courses with clayey beds ; rain cultivation is carried out, and the region is sufficiently similar to the Red Sea coast of the Sudan to justify the conclusion that it is an outbreak area. This was confirmed by a discovery of a marching band of phase *congregans* hoppers near Sabia in March 1936. Similar conditions probably extend down the coast of the Yemen.

Along the south-eastern coast of Arabia, of which only the western part was surveyed and where most of the solitary locusts were found in the neighbourhood of water-courses, the rainfall is very low and

indefinite, and there is no rain cultivation on sand, so that here conditions are less favourable for the production of the swarming phase. There are, however, certain areas in which locusts would become crowded if they multiplied sufficiently, so that the plain between Bab el Mandeb Straits and Ahwar must be regarded as a possible outbreak area.

In the Wadi Beihan area, at the south-western corner of Ruba' el Khali, the rainfall is too low in sandy parts for breeding to occur on a large scale, while higher up towards the mountains, where the rainfall is heavier, stony and clay soils form an unfavourable habitat, so that it is improbable that outbreak centres exist in this region.

In Oman, the coast south of Muscat, the Batina plain and the Trucial coast and interior were surveyed, but although good winter rains had fallen almost everywhere, only a few solitary locusts were found in sandy areas near Bareimi and Sohar, and it appears that no outbreak centres can exist there. There is, however, a possibility that locusts bred in Oman coastal areas may migrate to the interior, which sometimes receives some monsoon rains, and where concentration may occur (such as apparently occurs in the case of locusts bred on the Mekran coast, which migrate to the interior of Baluchistan [*cf.* **25** 161]), so that further investigations are required in this area.

It is pointed out in conclusion that investigations on *Schistocerca* have reached a stage in which practical measures of control in the outbreak centres, organised on an international basis, can be inaugurated.

MARSHALL (J.), PARSONS (F. S.) & HUTCHINSON (H.). **Studies on the Red Bollworm of Cotton,** *Diparopsis castanea*, **Hampson. –Part I. The Distribution and Ecology of two natural Food-plants,** *Cienfuegosia hildebrandtii*, **Gürke, and** *Gossypium herbaceum* **var.** *africana*, **Watt.**—*Bull. ent. Res.* **28** pt. 4 pp. 621-632, 2 pls., 1 map, 12 refs. London, December 1937.

Observations in southern Africa have shown that the only wild food-plants of *Diparopsis castanea*, Hmps., in the areas surveyed are *Cienfuegosia hildebrandti*, and *Gossypium herbaceum*, var. *africana* (often cited as *G. obtusifolium*) [*cf. R.A.E.*, A **24** 280; **25** 360], with the possible exception of *Thespesia* spp. on the coastal fringe of Zululand and Portuguese East Africa. It has been found that the larvae cannot mature on *Hibiscus calycinus* [*cf.* **16** 351]. *C. hildebrandti* occurs in parts of South Africa, Swaziland, Portuguese East Africa, Nyasaland, Southern Rhodesia and southern Tanganyika. *G. herbaceum* var. *africana* is apparently the only wild cotton in the eastern areas of South Africa and the south of Portuguese East Africa; this type and variations of it, have also been found far to the north on the easterly coastal belt of Africa, and westwards to the Gambia and other regions of West Africa.

Both plants are absent at altitudes above 1,200-1,300 feet and are rare above 1,100 feet. A survey of Swaziland, Zululand, and the eastern Transvaal as far north as Olifant's River showed that altitude precluded their development in the cotton-growing districts of mid-Swaziland and most of those in the eastern Transvaal. In the lower bushveldt (land with an elevation of less than 1,000 feet) and its marginal areas, numerous traverses were made to determine the types of plant association in which they occurred, and these are discussed in detail. The primary focus of *C. hildebrandti* was on the

crests and slopes of low hills and eminences with a good soil cover ; it was also found near water-courses, much of the seed, which is light and floats readily, being disseminated by water. Many pans are at the junction of several water channels, and plant associations in them are of the highest importance numerically, as they are often full of *C. hildebrandti* and the bollworm breeds extensively in them. This plant was never found on the stony thin soils that comprise perhaps 50–60 per cent. of the lower bushveldt. *G. herbaceum* var. *africana* appeared to flourish indiscriminately with regard both to habitat and to plant associations. Occasionally it occurred in large fairly well-defined colonies, but more commonly as small scattered clumps or isolated bushes. As it grows well on thin stony soil, it has a much wider distribution than *C. hildebrandti*. It is, however, seldom abundant, apart from colonies, and the authors consider that it could be eradicated without much difficulty in and about cotton-growing districts.

It is thought that control of the bollworm on rain-grown cotton in the lower bushveldt areas could be obtained by eradication of the natural food-plants together with a rigid close season in each cotton-planting year [*cf.* **26** 113]. In the region between the Lebombo Range and the Indian Ocean, where immense colonies of *C. hildebrandti* and very considerable quantities of *G. herbaceum* var. *africana* are present, eradication is probably impossible. If this area is developed, the infestation will probably be avoided only by growing irrigated cotton in the dry season.

GHILAROV (M. S.). **The Fauna of injurious Soil Insects of Arable Land.**— *Bull. ent. Res.* **28** pt. 4 pp. 633–637, 15 refs. London, December 1937.

Observations in the Ukraine showed that there was no significant decrease in the numbers of wireworms and other Coleopterous larvae in arable, fertile " black " soil after the clean summer fallow usually recommended for controlling them. It was found by analysis of soil samples that some species were more abundant in uncultivated soil, whereas others were equally common there and in soil that had been kept in clean fallow in the preceding year, and sometimes even more abundant in the latter. Although most soil pests can be either saprophagous or phytophagous, each species has a tendency towards one or other of these feeding habits. Cultivation creates conditions that are unfavourable to most phytophagous species, and even lethal to those that are obligatory plant feeders. The fact that greater injury is nearly always caused by species that commonly inhabit abandoned land carrying vegetation than by those that occur chiefly in the older farm lands in the " black " soils of the Ukraine proves that the former are mainly plant eaters while the latter are mainly saprophagous.

Crops are especially badly damaged by wireworms if they are sown just after the breaking of fresh ground, while on old farming soils the injury with the same degree of infestation is negligible. This may perhaps be explained by a difference in the species forming the wireworm populations in cultivated and uncultivated lands. The capacity of soil insects for saprophagy is the property that determines not only the differentiation of the injurious soil fauna of unelaborated and cultivated soils, but also the formation of natural soil-biocoenoses.

In soil that is moist enough and rich in humus and other decaying matter, insects able to be saprophagous have an advantage in the struggle for life, and therefore constitute the bulk of the fauna. In sandy soils, and others poor in decaying matter, where saprophagy gives no advantage, the fauna consists of almost purely phytophagous species.

The habitats of several species of Elaterid larvae in the Russian Union are briefly discussed from the literature [*R.A.E.*, A **23** 615; **25** 137; **26** 72].

VAPPULA (N. A.). **Tuholaisten esiintyminen vuosina 1934–1935.** [The Occurrence of Pests in Finland in 1934–35.]—*Valt. Maataloush. Tied.* no. 126, 12 pp., 4 maps. Helsinki, 1937.

Pests not mentioned in another report for 1935 [*R.A.E.*, A **24** 642] include *Eurydema oleraceum*, L., on crucifers, *Lilioceris merdigera*, L., on onions, *Anomala* (*Phyllopertha*) *horticola*, L., and *Harpalus rufipes*, DeG. (*Ophonus pubescens*, Müll.), which had not previously been recorded as pests in Finland, on apple and strawberry, respectively, *Argyresthia ephippella*, F., (*pruniella*, auct.) on cherry, *Hyalopterus arundinis*, F., on plum, *Xyleborus dispar*, F., on currant, *Eriosoma* (*Schizoneura*) *ulmi*, L., on currant and elm, *Byrsocrypta gallarum*, Gmel. (*Tetraneura ulmi*, DeG.) on elm, *Chionaspis salicis*, L., on mountain ash [*Sorbus aucuparia*], *Phalera bucephala*, L., and *Tetranychus tiliarius*, Herm. (*telarius*, auct.) on lime [*Tilia*], and *Tischeria complanella*, Hb., on oak.

LIRO (J. I.). **Die wichtigsten Daten der Pflanzenschutzgesetzgebung Finnlands.** [The most important Data of Plant Protection Legislation in Finland.]—*Veröffentl. LandwMinist.* no. 19, 17 pp. Helsinki, 1937.

This is a summary in German of legislation regulating the importation of plants and plant products into Finland.

MARTELLI (G. M.). **La lotta contro la *Deilephila lineata* var. *livornica* Esp. nel 1937 in Tripolitania.** [Measures against *Celerio lineata* var. *livornica* in 1937 in Tripolitania.]—*Agric. Libica* **6** no. 12 repr. 4 pp., 2 pls. Tripoli, December 1937.

In March and April 1937, the Sphingid, *Celerio* (*Deilephila*) *lineata* var. *livornica*, Esp., caused serious injury to vines in some districts of Tripolitania. The larvae hatched in February, developed in meadows until the grass dried and then invaded the vineyards. Lead arsenate sprays acted too slowly to prevent considerable damage and were ineffective in practice owing to faulty application by native workers. In experiments, barium fluosilicate sprays were more effective, mature larvae being killed in 48 hours by a concentration of 0·5 per cent. Newly hatched larvae in the laboratory were killed by a 0·3 per cent. concentration. Attempts to crush the migrating larvae with barrel staves gave unsatisfactory results as the ground was too rough, and barrier trenches proved useless as the soil was very loose and they were filled up by wind. Hand collection by boys moving along the rows of vines gave the best control.

Smit (B.). **The Cyanide Fumigation of Citrus Trees in the Eastern Cape Province, South Africa.**—*Bull. Dep. Agric. For. S. Afr.* no. 171, 39 pp., 1 col. pl., 2 fldg tables, 24 figs., 6 refs. Pretoria, 1937. Price 3*d*.

A detailed account is given of the procedure employed in South Africa in the fumigation of *Citrus* with hydrocyanic acid gas to control Coccids, particularly *Aonidiella aurantii*, Mask., together with dosage charts and directions for the application of the fumigant by various methods [*cf. R.A.E.*, A **26** 176].

Haines (G. C.). **Control of the Citrus Mealy Bug.**—*Fmg in S. Afr.* 1937 repr. no. 51, 2 pp. Pretoria, May 1937. [Recd. 1938.]

Formulae are given for an adhesive band mixture and two baits for the control of ants fostering the mealybug [*Pseudococcus citri*, Risso] on *Citrus* in eastern Cape Province. The adhesive mixture is composed of 27 oz. resin and 12 fl. oz. crude castor oil, with the addition of not more than 1½ oz. beeswax to make it more resistant to high temperatures. One of the baits has already been noticed [*R.A.E.*, A **21** 278], the other is composed of 3 lb. sugar, 1 lb. honey, 5 pints hot water and ¾ oz. sodium fluosilicate. The relative advantages of tins, reeds or waxed paper bags as containers are discussed. A few lumps of calcium cyanide in a tin at the base of the trunk of the tree have given a considerable degree of control in the Transvaal.

Ripley (L. B.). *Nosema* **Disease of** *Cactoblastis.*—*Fmg in S. Afr.* 1937 repr. no 81, 2 pp. Pretoria, August 1937. [Recd. 1938.]

Considerable mortality has been caused among larvae, pupae and adults of *Cactoblastis cactorum*, Berg, when they were being reared in South Africa for release against the prickly pear [*Opuntia*], by a species of *Nosema* that attacks the internal organs. Spores are present in large numbers in the excrement of diseased individuals, which is highly infective ; spores not eliminated in the excrement are liberated after the disintegration of the dead insect. An egg-mass laid by a diseased female may or may not be externally infected. A healthy female can be infected by a diseased male during pairing. Larvae hatching from egg-masses covered with spores become infected when they eat through the shell. Although the first generation liberated from diseased stocks is infected to about the same extent as the cage-bred larvae, the second generation in the field has very little disease. Some 102,000 eggs free of disease were obtained at a quarantine station and taken to a station where breeding is being carried out in the absence of *Nosema*. Mass-production continues at two other stations, where a rigid system of sanitation has been introduced to reduce the disease.

Oosthuizen (M. J.). **Industrial Fumigation. Progress made during recent Years.**—*Fmg in S. Afr.* 1937 repr. no. 1, 3 pp. Pretoria, October 1937.

In addition to a short general account of the procedure by which farmers can fumigate stored grain, etc., against insect pests in South Africa, notes are given on the dosages at which the different fumigants are employed and the conditions in which they are most effective.

Mossop (M. C.). **An unusual Winter Outbreak of Maize Weevil (*Calandra oryzae*, L.).**—*Rhod. agric. J.* **34** no. 12 pp. 935–941. Salisbury, S. Rhod., December 1937; also *Bull. Minist. Agric.* [*S. Rhod.*] no. 1050, 7 pp.

An unusually heavy infestation by *Calandra oryzae*, L., in maize fresh from the farm was observed in Southern Rhodesia at the end of July 1937. An investigation into the probable cause of field infestation showed that the early cessation of rain and the consequent accelerated ripening of the crop were primarily responsible, as they rendered the maize favourable to early attack and enabled the weevil to produce an extra generation before harvesting took place. Infestation in maize ripening at successively later dates decreased, whereas it usually increases. This was probably due to the moisture content of the grain falling below the minimum necessary to support the weevil. As the practice of stooking has increased greatly in recent years, its influence on the incidence of *C. oryzae* in the field will be studied. The importance of carefully burning old material from shelling dumps or converting it into compost is emphasised.

Ripley (L. B.), Petty (B. K.), Hepburn (G. A.) & v. d. Westhuysen (J. P.). **Control of the Wattle Bagworm (*Acanthopsyche junodi* Heylaerts) by Dusting with Natural Cryolite.**—*Sci. Bull. Dep. Agric. For. S. Afr.* no. 15, 22 pp., 4 refs. Pretoria, 1936. Price 3*d*. [Recd. 1938.]

The primary purpose of this paper is to acquaint growers of wattles (*Acacia mollissima* and *A. decurrens*) in South Africa with the results of experiments in the field and laboratory on the control of *Acanthopsyche junodi*, Heyl. (wattle bagworm) by dusting with natural cryolite [*cf. R.A.E.*, A **22** 532], and to make clear the advantages and limitations of the method and the technique employed. An account is given of factors that affect the amount of deposit left on the foliage both during and after application of a given amount of insecticide per acre; the former include weather conditions and air-currents, the size and species of the wattle trees and their distance from the point of application, and the latter include wind and rain. In a section on the mortality produced, the points discussed include the influence on mortality of initial deposit and the subsequent loss in deposit, the factors determining the amount of feeding [**25** 102], and the instar of the larvae. Practical points considered are the determination of the correct time for dusting by cutting open the bags of the females from the plantation to see if the eggs are hatching, the technique of dusting, the type of machine employed, the labour necessary and the estimated costs.

Smee (C.). **The Eucalyptus Weevil, *Gonipterus scutellatus* Gyll., in Nyasaland.**—*E. Afr. agric. J.* **3** no. 3 pp. 173–175. Nairobi, November 1937.

In March 1937, *Gonipterus scutellatus*, Gyll., which has been a pest in many parts of the Union of South Africa for some years [*R.A.E.*, A **12** 345; **13** 38; **14** 411], was found to be distributed in considerable numbers on *Eucalyptus* over the southern third of Nyasaland, where it had not previously been recorded. It was not found at very low

elevations or above 3,000 ft. From March to September 1937, it appeared to breed continuously. Serious damage has not yet been reported or observed, owing partly to the Mymarid, *Anaphoidea nitens*, Gir. [*cf.* **16** 648; **19** 447], which has the same distribution and which had parasitised 80–90 per cent. of the eggs examined. The possible means by which the weevil and its parasite were introduced into Nyasaland are discussed.

MOUTIA (L. A.). **Notes sur l'introduction à Maurice de nouveaux prédateurs de la cochenille du cocotier** *Aspidiotus destructor* **Sign.**—*Rev. agric. Maurice* no. 95 pp. 164–165. Mauritius, 1937.

It has not been found possible to arrange for importation from Trinidad, Fiji and Ceylon of natural enemies for the control of *Aspidiotus destructor*, Sign., on coconut in Mauritius [*cf. R.A.E.*, A **23** 68], but in March 1937, a first consignment of pupae and adults of *Chilocorus politus*, Muls., and some species of *Scymnus* [*cf.* **23** 279] was received from Java. The methods of transporting them are described. The 347 and 152 living examples of *Chilocorus* and *Scymnus* were liberated in a coconut plantation heavily infested by *A. destructor*, and larvae, pupae and adults of both Coccinellids were observed two months later.

DUPONT (R.). **L'invasion de plus en plus menaçante d'une fourmi nuisible.**—*Rev. agric. Maurice* no. 95 pp. 184–185. Mauritius, 1937.

The ant, *Technomyrmex albipes*, F. Smith, is extremely common in houses and plantations in Mauritius, and fosters Coccids. No satisfactory measures of control are known.

SUBRAHMANIAM (T. V.). **Report of Work done in the Entomological Section for the Year 1935–36.**—*Rep. Mysore agric. Dep. 1935–36* pp. 57–59. Bangalore, 1937.

An account is given of work in progress on insect pests in Mysore in the year ending June 1936; the results of some of the experiments have already been noticed [*R.A.E.*, A **25** 598, 599]; others confirmed those carried out in the previous year [**25** 220]. Stored ragi [*Eleusine coracana*] that was not kept dry was infested to some extent by *Rhizopertha dominica*, F., and *Alphitobius* sp.; in laboratory experiments on control, infested ragi was covered with a layer of sand, and in every test the beetles came to the surface of the sand, failed to enter it again and eventually died. Late-sown cotton was damaged by *Sphenoptera gossypii*, Cotes, which appears to have no alternative food-plants. More than 5 months elapse between harvest and the sowing of the seed in the black cotton areas, and the adults then feed on the leaves of the old cotton plants; no breeding occurs during this period. A parasite, probably a Trichogrammatid, was reared from the eggs of this Buprestid, and the larvae were parasitised by the Braconid, *Glyptomorpha smenus*, Cam.

Tests showed that the insecticidal value of alcoholic extracts of the seeds of *Tephrosia candida* and *T. villosa* was equal to that of nicotine sulphate.

VAN DER GOOT (P.). **Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1936.** [Diseases and Pests of cultivated Plants in the Netherlands Indies in 1936.]—*Meded. Inst. PlZiekt.* no. 89, 104 pp. Buitenzorg, 1937. Price *Fl.* 1·25.

Very brief records are given of some 130 injurious insects and mites observed in various parts of the Netherlands Indies during 1936, showing the crops they attacked and the districts in which they occurred.

CARESCHE (L.). **Une noctuelle polyphage,** *Prodenia litura* **Fab.**—*Bull. écon. Indochine* **40** fasc. 3 pp. 517–537, 3 pls., 7 refs. Hanoi, 1937.

A detailed account is given of observations on the bionomics of *Prodenia litura*, F., in Indo-China, and all stages are described. The distribution of this Noctuid is briefly reviewed, and a list is given of a large number of its food-plants, which include most of the important field crops in Indo-China, particular damage being done to tobacco and castor. The females begin to oviposit 2–3 days after emergence and lay their eggs in batches on the lower surface of the leaves, generally towards the centre of the plant. In the laboratory, they laid 6–9 batches, each of about 300 eggs, and lived for 5–11 days. The egg, larval and pupal stages lasted 2½–7, 11–26 and 7–11 days, respectively. There were usually 6 larval instars, but sometimes 2 supplementary ones were intercalated between the 5th and 6th. There are 8–10 generations a year in Tonkin and 11–12 in Cochin China.

Newly hatched larvae were very susceptible to dry heat, which caused a high mortality. In the early instars, they remained on the lower surface of the leaves during the day but were sometimes active. In the last 2 instars, however, they fed only at night, and sheltered during the day under the lowest leaves, sometimes burying themselves at the foot of the plant.

Two Braconid parasites were found in Tonkin. One, a Microgasterine, oviposited in larvae in the first or second instar. The parasite larva emerged in about a week and spun a cocoon on the host, which died some time later. The adult parasite emerged after 4 days. This Braconid was easily reared in the laboratory, and up to 80 per cent. of the larvae in some colonies in the field were attacked by it. The other Braconid was generally less common, but parasitised 90 per cent. of the larvae in one colony. The host larvae were in the late fifth instar before the parasite larvae left them. In Cochin China, Nanta has observed a Hymenopterous and a Tachinid parasite; *P. litura* appears to be more common there than in the north of Indo-China. In the field, larvae of *P. litura* were attacked by a polyhedral disease, and larvae fed on leaves treated with an extract from diseased individuals died in 5–6 days.

Methods of control include hand-picking of the larvae and the leaves on which the eggs are laid. In experiments in which the larvae were fed on leaves of castor poisoned with suspensions of 0·4 per cent. lead arsenate, 0·6 per cent. sodium fluosilicate or 0·8 per cent. barium fluosilicate, the percentage mortality after 90 hours was 100, 100 and 52, respectively. All three insecticides were repellent to the larvae, and the sodium fluosilicate scorched the foliage. It is recommended that sprays of barium fluosilicate or lead arsenate, at the concentrations tested with the addition of some adhesive, should

be applied in the rainy season. In the dry season, a dust of barium fluosilicate and talc (2 : 3), applied every 3 weeks to tobacco, gave complete protection.

NANTA (—). **Note préliminaire sur les propriétés insecticides du** *Stemona tuberosa*.—*Bull. écon. Indochine* **40** fasc. 3 pp. 539–542, 1 pl. Hanoi, 1937.

Tests were carried out at Saigon on the toxicity to insects of sprays prepared by steeping or boiling chopped roots of *Stemona tuberosa* in water or extracting them with solvents and mixing the extracts with water. At normal strength (that used unless otherwise stated), the sprays contained the equivalent of 10 gm. fresh roots in 100 cc. water; if the roots were dried, they were weighed before drying. A spray prepared by boiling fresh roots in water for 45 minutes killed all larvae of the Pierid, *Catopsilia crocale*, Cram., in 2 days; at half strength, the spray was almost as effective. It was practically ineffective against adults of *Dysdercus cingulatus*, F., except at 2–2½ times the normal strength, at which it paralysed the bugs for 24 hours or more, although some had recovered after 10 days. The addition of saponin had no effect, but decoctions made with salt solution were more toxic to larvae of *C. crocale*. Sprays made by steeping fresh roots in cold water for 24 hours did not give complete mortality of *C. crocale* even with the addition of saponin, which increased their effectiveness, but when the roots were steeped for 48 hours, the sprays gave complete mortality of *C. crocale* in a day and of *D. cingulatus* in a longer period.

Decoctions of the dried roots were tested against other insects. At normal and half strength with 2 per cent. saponin they gave 90 per cent. mortality of crickets in 5 days and 40 per cent. mortality of the weevil, *Hypomeces squamosus*, F., in 6 days. At full strength with saponin and at half strength they killed 100 and 90 per cent., respectively, of larvae of a Lycaenid.

Extracts of the roots made with five different solvents were tested on *Calandra oryzae*, L. Carbon tetrachloride, chloroform, ether, alcohol and benzine extracts gave mortalities of 77, 70, 62, 53 and 33 per cent., respectively, when used alone, and 81, 57, 60, 57 and 23 per cent., when used with 2 per cent. saponin. Mortality in controls was 5 per cent. The ether extract with saponin paralysed larvae of *Catopsilia crocale* in a few minutes, and all were dead in 24 hours.

KOREISHI (K.). **Morphology and Life-history of the Melon Fly in Formosa.** [*In Japanese.*]—*Res. Bull. Pl. Quar. Sta. Formosa* no. 2, 74 pp., 5 pls. Taihoku, Bur. Ind. Govt. Formosa, Publ. no. 798, October 1937. (With a Summary in English.)

Dacus (*Chaetodacus*) *cucurbitae*, Coq., all stages of which are described, is very injurious to cucurbits, especially cucumber, melon and *Luffa cylindrica*, in Formosa. It has 8 or 9 generations a year and is most abundant from June to August. The fruits are infested only when young [*cf. R.A.E.*, A **25** 228]. The adults live for long periods, some surviving for 381 days in captivity. The intervals between emergence and pairing or oviposition vary with the time of year [*cf.* **24** 122]. The flies oviposit daily in summer, but lay no eggs in winter if the temperature is below 15°C. [59°F.]. Females emerging

in April and June produced averages of 816 and 1,043 eggs, respectively. The egg, larval and pupal stages lasted about 1, 3–4 and 7 days, respectively, in summer and 3–4, 12–20 and 28–32 days in January and February. The percentage of eggs that hatch was much reduced at low temperatures.

KOIDSUMI (K.). **Heat Sterilisation of Formosan Fruits against Fruit Flies. III. Results on Plum** (*Prunus salicina* **Lindl.), Mango** (*Mangifera indica* **L.), Zabon** (*Citrus maxima* **Merr.) and Ponkan** (*Citrus poonensis*, **Hort.).** [*In Japanese.*]—*J. Soc. trop. Agric.* **9** no. 3 pp. 275–286. Taihoku, 1937.

In further experiments in Formosa on the use of moist heat to destroy *Dacus* (*Chaetodacus*) *dorsalis*, Hend., in fruits [*cf. R.A.E.*, A **24** 629], the following exposures gave complete mortality of the eggs and larvae without injury to the fruits; in Japanese plum (*Prunus salicina*), 40°C. [104°F.] for 16 hours, 42°C. [107·6°F.] for 8, and 44°C. [111·2°F.] for 4; in mango, 40°C. for 20, 44°C. for 8, and 46°C. [114·8°F.] for 4; and in fruits of *Citrus poonensis*, 40°C. or 42°C. for 20, and 44°C. for 8. The periods required to kill eggs and larvae in grapefruit were 3 days at 40°C., 2 at 42°C. and 1 at 46°C., and such exposures injured the fruits and affected their flavour.

SONAN (J.). **The grey-streaked Moth,** *Prodenia litura* **Fab. in Formosa.** [*In Japanese.*]—*Rep. Govt Res. Inst. Formosa* no. 70, 69 pp., 1 pl. Taihoku, October 1937.

A detailed account is given of the bionomics of *Prodenia litura*, F., in Formosa, a briefer survey of which has already been noticed [*R.A.E.*, A **25** 336]. All stages are described. This Noctuid is widely distributed, occurring up to an altitude of about 5,000 ft., and has now been recorded from over 90 species of plants. The adults pair on the day of emergence and oviposit on the leaves of the food-plants, which include ground-nuts, sweet potato, rice, castor and vegetables. Females have been observed to lay up to 14 batches of eggs. The larvae do not feed at temperatures below 15°C. [59°F.]. When mature they pass through a prepupal stage in the cocoon, which lasts 3·2–8·5 days. In addition to Hymenopterous parasites [*loc. cit.*], the larvae are attacked by the Tachinid, *Cnephalia* (*Gonia*) *cinerascens*, Rond., and a species of *Sarcophaga*, but none of the natural enemies observed in Formosa is of much importance. A list is given of those recorded throughout the world. Lead arsenate in sprays is effective against young larvae, but older ones do not feed on leaves treated with it. Derris dusts are ineffective, as are also contact sprays, which do not adhere to the smooth body surfaces of the larvae. Trenches can be used to catch larvae that are migrating.

MURAYAMA (J.). **Notes sur les Scolytides (Coléoptères) de la Corée.**—*Tenthredo* **1** no. 4 pp. 367–375. Shinomiya, Yamashina, Kyoto, November 1937.

In this paper, which is supplementary to previous ones [*R.A.E.*, A **19** 338; **21** 384], a list is given of the 67 species of Scolytids and Platypids now known to occur in Korea. Four Scolytids from conifers are described as new; others are recorded for the first time from Korea or from additional food-plants.

WATANABE (F.). **List of Insect Pests of Trees in Japan.** [*In Japanese.*] 487 + 27 + (Index) 15 pp. Tokyo, the author, September 1937. Price *Y*. 13.

Lists, arranged in systematic order and by food-plants, are given of some 2,000 insects attacking trees in Japan, Korea and Formosa.

SAKAI (S.). **Studies concerning** *Eutettix disciguttus* **Walk.** [*In Japanese.*]—*Nagano-Ken seric. Exp. Sta. Rep.* no. 39 repr. 70 pp., 5 pls. Nagano, Japan, 1937.

SAKAI (S.). **On the Transmission of a Mosaic-like Disease of Mulberry by** *Eutettix disciguttus* **Walk.** [*In Japanese.*]—*T.c.* repr. 13 pp., 3 pls.

Descriptions are given of all stages of *Eutettix disciguttus*, Wlk. a Jassid that occurs on mulberry in Japan, and, though not in itself very injurious, transmits a mosaic-like disease of economic importance. It has 2–3 generations a year, hibernating in the egg stage. Adults kept singly in cages lived for 54–76 days. They are usually found on the tips of young shoots of mulberry, are very active and gregarious, and are attracted to light. One female lays 25–125 eggs, most of them 6–20 days after emergence. They are usually deposited under the bark of the young twigs and sometimes in the veins and stalks of the leaves. The egg stage lasts 12–17 days from June to August; the over-wintered eggs hatch in May. The Jassids were able to complete a generation on rose and a few other plants; they survived for a considerable time on apple, fig, pea, soy bean, potato and *Eriobotrya japonica*, but not on peach, plum or pear. Natural enemies include the ant, *Formica fusca*, L., a Neuropterous larva and a Dryinid parasite. A number of different contact sprays proved effective against the nymphs and adults.

In experiments, adults from nymphs reared on mulberry trees suffering from the mosaic-like disease infected healthy trees when fed on them for 20 days.

EVANS (J. W.). **The biological Control of the Apple Leaf-hopper (*Typhlocyba froggatti*, Baker).**—*Tasm. J. Agric.* **8** no. 4 pp. 171–173, 3 figs., 2 refs. Tasmania, November 1937.

Typhlocyba froggatti, Baker (*australis*, Frogg.), which was introduced into Tasmania some years ago [*cf. R.A.E.*, A **21** 409], is spreading rapidly and is likely to become established in all apple orchards in the state. It is particularly numerous in hot, dry summers. In New Zealand, the eggs of this leafhopper are heavily parasitised by *Anagrus armatus*, Ashm. [var. *nigriventris*, Gir.] [**22** 656; **26** 57]. Two consignments of this Mymarid were received in Tasmania during the winter of 1935 and divided into four batches, three being liberated and one kept for observation. An examination during the following winter failed to show the presence of the parasite, but it was found to be well established in August 1937.

EVANS (J. W.). **Strawberry Beetles.**—*Tasm. J. Agric.* **8** no. 4 pp. 199–202, 4 figs. Tasmania, November 1937.

Of the four species of Coleoptera that have been recorded as pests of strawberries in Tasmania, *Rhinaria perdix*, Pasc., occurs

too rarely to merit attention. The most serious injury is done by *Otiorrhynchus sulcatus*, F., the adults of which appear from mid-October to late November in an early season and from mid-November to mid-December in a later one. Oviposition begins about 6 weeks after the first appearance of the adults and continues for 3 months. Eggs are laid in batches of 5–12, and one female can lay 1,000. The egg stage lasts 1½–3 weeks. Larvae from eggs laid early in the season are full-fed by the end of the summer and pass the winter as prepupae below the surface of the soil. Larvae from eggs laid late in the season complete their development in September and pupate during October. There is one generation a year. Control methods include clean cultivation, hoeing in September, and the use of poison baits. A bait of 1 lb. bran, 1 pint molasses, 4 oz. calcium arsenate and 2 qts. water, applied at the rate of 75 lb. per acre before oviposition has begun and again 3–4 weeks later in heavy infestations, is recommended. *Rhadinosomus lacordairei*, Pasc., usually feeds on *Eucalyptus*, but the larvae sometimes kill strawberry plants by mining the stems and attacking the crown. Sickly plants should be burnt, and when ground is known to be infested, tobacco dust may be placed in the holes at planting time. Adults of *Haltica pagana*, Blkb., appear in early summer and lay their eggs in clusters on leaves, and the larvae and adults feed on leaves and fruit of strawberry. Derris dust is recommended for control.

Insect Pests and their Control.—*Agric. Gaz. N.S.W.* **48** pts. 10–11 pp. 565–568, 617–620, 15 figs. Sydney, 1937.

The first of these two parts of a series on insect pests in New South Wales [*cf. R.A.E.*, A **26** 111] includes brief notes on the seedling bean midge [*Camptocladius macleayi*, Skuse (*cf.* **11** 188)]. Early bean crops in some coastal areas were attacked by the larvae in August and September 1937, and infestation of cucumbers and squashes, recorded for the first time, was so severe in one locality that some early crops had to be resown. The larvae usually feed on decaying plant material in the soil. Under cold wet conditions, when the germination of the beans is retarded, fermentation processes seem to render the seeds attractive to the larvae, which enter them as soon as the seed-coats burst. They attack the cotyledons and may destroy the whole shoot. When the latter is not damaged the plant may recover, although growth is much delayed. Pupation takes place in a loosely constructed cell in the soil. On high, warm, well-drained slopes, beans are not affected, but in cold, damp, low-lying situations, infestation may occur throughout the field. When the weather in the winter and early spring has been cold and wet, such areas should be sown 3–4 weeks later than in normal seasons.

The insects discussed in the second part include *Aphodius howitti*, Hope, which has recently become particularly abundant and injured pasture grasses and clovers in several districts of New South Wales. It is always common on the Southern Tablelands and has sometimes caused considerable damage to golf greens in that area. The adult beetles occur in the spring and early summer. During the day the larvae shelter in vertical tunnels in the soil, but at night they emerge and bite off pieces of young grass, which they take back to their tunnels. Thus the surface is gradually denuded, although the grass generally recovers after the larvae pupate, which they do in late

winter and early spring. Infestation is usually restricted to limited areas, and the ovipositing beetles are particularly attracted to sheep camps. In such cases effective control may be obtained by lead arsenate applied as a 50 per cent. dust at the rate of 1½ lb. dust per 1,000 sq. ft., or as a spray, 1 lb. in 25 gals. water. Treatments should be given in the late summer ; when two applications are necessary there should be an interval of several months between them. Golf greens may be similarly treated, or they may be top dressed with 5 lb. lead arsenate in 1 bushel top soil for every 1,000 sq. ft.

MORGAN (W. L.). **Green Aphids on Tomatoes. Add White Oil Emulsion to the Nicotine Sulphate - Bordeaux Spray.**—*Agric. Gaz. N.S.W.* **48** pt. 11 p. 616, 1 fig. Sydney, 1st November 1937.

For the last two years, late autumn and early spring tomatos in many districts of New South Wales have been infested by a large green Aphid that has caused considerable damage, especially in cool dry weather. Attempts to control it by adding nicotine sulphate to the Bordeaux spray generally applied to these crops were unsuccessful, and the sprays caused severe scorching of the young leaves and flower buds and scarring of the fruit. Experiments showed that tomatos infested with the Aphid were very susceptible to injury by Bordeaux sprays, but that the nicotine sulphate was innocuous. Injury was apparently increased where lead arsenate was added for the control of fruit caterpillars [*cf. R.A.E.*, A **25** 296]. Scorching did not occur when white oil (1 : 100) was added to Bordeaux alone or with nicotine sulphate (1 : 800) with or without lead arsenate (1½ lb. in 40 gals.). Effective control was obtained with the spray of Bordeaux, nicotine and oil, but weekly applications resulted in the development of small corky patches in the fruit. Subsequent tests showed that when the spray contained less white oil (1 : 150) both fruit and foliage were unaffected, and it gave better control of Aphids than sprays without oil. The addition of this oil to Bordeaux sprays prevented scorching of uninfested plants in hot weather.

WALLACE (R.). **The Banana Beetle Borer. Investigations and Control Measures.**—*Agric. Gaz. N.S.W.* **48** pt. 11 pp. 621–623, 638, 1 fig. Sydney, 1st November 1937.

For the past four years, observations have been made on the bionomics and control of *Cosmopolites sordidus*, Germ., on banana in the north-eastern areas of New South Wales. It was found that only non-growing, dead or decaying material is heavily infested and that vigorous plants are infrequently and only slightly damaged. Weakened plants in neglected or exhausted plantations or in poor, inadequately drained soil are sometimes severely attacked ; and in cultivated but old plantations where the corms have emerged far out of the soil tunnelling in the green plants is usually more abundant than in normal green ones. It is concluded that the destructiveness of the weevil has been greatly exaggerated. Cultural methods, which should be employed to give the maximum production, are those that will give the best control of the borer, and it is thought that ultimately the maintenance of soil fertility will necessitate crop rotation, which will involve replanting and so eliminate the problem of corms growing

out of the soil. Only vigorous uninfested suckers should be used for planting.

The following additional measures may be used to reduce the beetle population. Material in which they breed should be destroyed by splitting the spent stems as soon as the bunch is cut. Spent stems may, however, be left on the ground near the stools as oviposition traps, and should be split after 4 and 10 weeks in the summer and winter, respectively, so that they will dry out and the larvae in them be unable to complete their development. They may also be cut transversely into 10–14 slices that are placed in the stools as baits, covered, and left for 4–6 days, after which the weevils are collected by hand. These burrow into and oviposit in the baits, which suggests that they or the spent stems might be used to protect the newly planted suckers. In this case, they should be left for 3 weeks before being destroyed. Paris green, either mixed with flour and applied as a dust to the bases of the growing plants or used in poison baits, gave some degree of control.

Caldwell (N. E. H.). **Banana Rust Thrips Control.**—*Qd agric. J.* **48** pt. 4 pp. 392–399, 1 fig. Brisbane, 1st October 1937.

The nature of the injury caused to bananas by *Scirtothrips signipennis*, Bagn., is discussed. The decline in the importance of this pest in southern Queensland since 1931 [*R.A.E.*, A **21** 105; **24** 197, etc.] has been maintained, but is still regarded as temporary. The eggs are laid just beneath the surface of the plant tissue, usually either on the fruit or on the pseudostem under the edges of the leaf-sheaths. Larvae and adults may be found on any part of the pseudostem beneath the edges of the leaf-sheaths, and particularly in and around the funnel leaf and on the fruit. The pupal stage is passed in the soil. The egg, larval and pupal stages each last 7–10 days during the summer and longer in the colder months. Notes are given on three other thrips frequently confused with *S. signipennis*.

The most satisfactory method of control is enclosing the bunches in bags of fine hessian as soon as they emerge from the throat of the plant and applying a light dust containing not less than 2 per cent. actual nicotine in the form of nicotine sulphate or free nicotine at fortnightly intervals throughout the life of the bunch, or at weekly intervals for a month after the bunch is thrown. The dust is applied through a small hole in the bottom of the bag; the first application may be made before the bag is put on. Fair control at less cost can be obtained by dusting at weekly intervals without using bags, or by wrapping a fine hessian "cloak" round the bunch and dusting at fortnightly intervals. Control should be begun in November if the population necessitates it and continued until the end of April, but bags should be left until the fruit is harvested as they protect it from sun scald, cold, black pit, and incidental pests. Cultural methods and regulating the time of bearing also contribute to control.

Simmonds (H. W.). **Division of Entomology. Annual Report for 1936.**—*Annu. Bull. divl Reps Dep. Agric. Fiji 1936* pp. 27–29. Suva, 1937.

Insect pests observed in Fiji in 1936 included *Agonoxena argaula*, Meyr., *Promecotheca reichei*, Baly, and *Levuana iridescens*, B.-B., on

coconut. Notes are given on work in progress, which has been the subject of subsequent papers [*R.A.E.*, A **25** 588; **26** 58, 59]. Beneficial insects shipped to other countries included *Plaesius javanus*, Er., to Porto Rico [**25** 758]; *Teleonemia lantanae*, Dist., to Samoa and New South Wales; and *Tetrastichus giffardianus*, Silv., to Samoa, Rarotonga, New Caledonia and Western Australia [*cf.* **24** 447]. A consignment of adults of the Scelionid, *Telenomus nawaii*, Ashm., which parasitises the eggs of *Prodenia litura*, F., was sent to New South Wales, where they were given food and water, and forwarded by air to Cairo, the whole journey lasting 23 days. A sufficient number survived for the successful breeding of a new generation, adults of which emerged in 3 weeks.

COMPERE (H.). **The Species of *Aenasius*, Encyrtid Parasites of Mealy-bugs.**—*Proc. Hawaii. ent. Soc.* **9** no. 3 pp. 383–404, 4 figs. Honolulu, September 1937.

Among a miscellaneous lot of beneficial insects imported from Brazil into California were three females of a parasite here described as *Aenasius paulistus*, sp. n. It was found that they were able to reproduce in *Pseudococcus maritimus*, Ehrh.; the offspring were males. In an attempt to classify this parasite, a taxonomic study was made. Notes are given on the characters and scope of the genus *Aenasius*, with a key to distinguish it from *Chalcaspis* and *Neodiscodes*, to which it is closely allied, and another key to the females of the species of the genus. Ten of these species are described as new, *viz.*: *A. ianthinus* from *Ferrisiana* (*Pseudococcus*) *virgata*, Ckll., and *A. frontalis*, both taken in Panama; *A. advena* from *P. virgatus* in Hawaii; *A. punctatus* from *Phenacoccus* sp., *A. paulistus* from *Pseudococcus* sp., *A. longiscapus* and *A. cariocus*, all in Brazil; *A. maplei* from *Puto yuccae*, Coq., in California; and *A. pacificus* and *A. insularis* both in las Tres Marias Islands, Mexico. The others are *A. chapadae*, Ashm., and *A.* (*Chalcaspis*) *brasiliensis*, Mercet, from Brazil; *A. coeruleus*, Brues, from Mexico, and *A. hyettus*, Wlk., redescribed from individuals taken in Panama and Granada. A supplementary note records the finding of two species of *Aenasius* among a collection of parasites introduced into Hawaii from Colombia for the control of *Pseudococcus brevipes*, Ckll. Both were reared from *Pseudococcus* sp.; one is *A. cariocus*, and the other is described as *A. colombiensis*, sp. n. It is stated in an editorial foot-note that *A. advena* is probably a species that was introduced into Hawaii from Mexico in 1929.

FULLAWAY (D. T.). **Notes on the Taro Leafhopper** (*Megamelus proserpina* **Kirk.**) (**Delphacidae**).—*Proc. Hawaii. ent. Soc.* **9** no. 3 pp. 405–406. Honolulu, September 1937.

Megamelus proserpina, Kirk., which was thought to have been eradicated in 1930, has reappeared in Hawaii and is doing considerable damage to taro [*Colocasia*]. As the infested area is apparently very restricted, eradication will again be attempted. Notes on the life-history are given from observations made in the Philippine Islands in 1931. The eggs are deposited principally in cavities hollowed in the stems. Each cavity usually contained two eggs. The egg and nymphal stages lasted 8–9 and 13 days, respectively. All the adults were short-winged, like those in Hawaii. The egg-tubes in the female were fully developed 3 days after the adult stage was reached. Males and

females occurred in equal numbers ; pairing is believed to take place at night. This Delphacid was not found on any plant other than taro. It was heavily parasitised by *Paranagrus perforator*, Gir., *Ootetrastichus* sp. and a Dryinid. When first observed in Hawaii, it was attacked by a Dryinid and the Capsid, *Cyrtorhinus*.

MARLOWE (R. H.). **Susceptibility of two Tomato Varieties to Infestation by** *Chaetodacus cucurbitae* **(Coq.).**—*Proc. Hawaii. ent. Soc.* **9** no. 3 pp. 407–408. Honolulu, September 1937.

During tests of a bait-spray against *Dacus* (*Chaetodacus*) *cucurbitae*, Coq., on tomatos in Hawaii, it was observed that the two varieties used differed considerably in susceptibility to infestation. One produced twice as many fruits per plant as the other, but more than eight times as many marketable fruits. The average infestations by *D. cucurbitae* on the two varieties were 19·3 and 59·3 per cent. respectively, and the percentages of marketable fruit 63·5 and 16·4.

SAKIMURA (K.). **A Survey of Host Ranges of Thrips in and around Hawaiian Pineapple Fields.**—*Proc. Hawaii. ent. Soc.* **9** no. 3 pp. 415–427, 22 refs. Honolulu, September 1937.

Data were collected in 1930 and 1931 and subsequently on the food-plants of thrips in and around pineapple fields in Hawaii in connection with a study of the transmission of pineapple yellow spot, of which *Thrips tabaci*, Lind., has been proved to be a vector [*cf. R.A.E.*, A **19** 744 ; **20** 639]. A list is given of 39 thrips belonging to 20 genera with the food-plants with which each was associated. The most important species, with the widest range of food-plants and high relative population density, were *T. tabaci*, *Taeniothrips hawaiiensis*, Morgan, and *Haplothrips gowdeyi*, Frankl. The last two are polyphagous flower-feeders, but neither has pineapple among its food-plants. A table of thrips and diseases with which they are known to be, or suspected of being, associated is compiled from the literature and in another is a list of the 20 plants known to be susceptible to yellow spot and the relative population density of the 15 species of thrips associated with them. *Thrips tabaci* is the only species widely distributed on them. *Thrips abdominalis*, Crwf., and *H. gowdeyi* are strongly suspected of being vectors ; they breed on *Emilia* which is the chief host of the disease, and are polyphagous.

SUEHIRO (A.). **New Records of Mealybugs in Hawaii.**—*Proc. Hawaii. ent. Soc.* **9** no. 3 pp. 429–430. Honolulu, September 1937.

Notes are given on the appearance and food-plants of *Pseudococcus maritimus*, Ehrh., and *Phenacoccus solani*, Ferris, which have been discovered in Hawaii on gladiolus corms and *Portulaca oleracea*, respectively, in spite of rigid quarantine regulations that had previously kept the islands free from them.

SWEZEY (O. H.). **Notes on Potato Insects in Hawaii.**—*Proc. Hawaii. ent. Soc.* **9** no. 3 pp. 433–435. Honolulu, September 1937.

Potatoes recently grown on a large scale on fallow cane lands on Oahu were attacked by a number of insects not previously recorded

on this crop in Hawaii, *viz.*, *Laphygma exigua*, Hb., which fed on the plants to which it moved from weeds growing in the fields, *Agrotis ypsilon*, Hfn., and *Lycophotia margaritosa*, Haw., which fed on the plants and tubers, *Plusia chalcites*, Esp., which produced a ragged appearance of the leaves, but was not abundant enough to do distinct injury, *Asynonychus* (*Pantomorus*) *godmani*, Crotch, of which one larva was found boring into a tuber, *Conoderus exsul*, Sharp, of which a larva was found in a decaying tuber, but was not the cause of the rot, *Empoasca solana*, DeLong, and *Stictocephala festina*, Say, which were found in very small numbers on the foliage, *Aphis gossypii*, Glov., which was general in one field, causing the foliage to dry prematurely, and *Myzus persicae*, Sulz. Several insect enemies of the Aphids were also observed. *Phthorimaea operculella*, Zell., is considered the worst pest of potatoes in Hawaii, but was not found on this occasion.

Illingworth (J. F.). **A Study of Blossom-drop of Tomatoes and Control Measures.**—*Proc. Hawaii. ent. Soc.* **9** no. 3 pp. 457–458, Honolulu, September 1937.

In September 1936, the tips of the branches of a large tomato plant were found to be infested with great numbers of *Cyrtopeltis varians*, Dist. (*Engytatus geniculatus*, Reut.), which has been a troublesome pest of tomatos in Hawaii for some years [*R.A.E.*, A **18** 251]. The plant, which had been bearing prolifically, ceased to do so, and nearly all the blossoms dropped before they opened. The newer growths had sunken, purplish rings, caused by the feeding of the bugs, and stems had a tendency to break at the injured places. Nymphs were abundant around the unopened flower-buds, and when some of the latter were placed in a glass tube, many nymphs hatched from them. The few flowers that opened developed abnormal fruits, with rings of scars that appeared to be egg-punctures. There are 5 nymphal instars, lasting together 9–10 days. The adults are very active during the warm parts of the day. Contact sprays give successful control.

Illingworth (J. F.). **Observations on the Predaceous Habits of *Cyrtopeltis varians* (Dist.) (Hemip.).**—*Proc. Hawaii. ent. Soc.* **9** no. 3 pp. 458–459, 1 ref. Honolulu, September 1937.

Difficulty was experienced in rearing *Cyrtopeltis varians*, Dist., on tomato shoots [*cf.* preceding paper], but in one instance, Aphids present on the shoots were found to have been sucked dry. Pineapple mealybugs [*Pseudococcus brevipes*, Ckll.] in all stages on beans were then put into the cages. The young mealybugs migrated to the tomato, and the Capsids, including second-instar nymphs, soon began feeding on them. Most of this food-supply had been used up in a few days, and the Capsids were successfully reared without any losses. They also fed on eggs and newly-hatched larvae of the cabbage butterfly [*Pieris rapae*, L.] on nasturtium leaves.

Fisher (W. S.). **A new Anobiid Beetle from Alaska.**—*J. Wash. Acad. Sci.* **28** no. 1 pp. 26–27. Menasha, Wis., 15th January 1938.

The Anobiid, *Hadrobregmus destructor*, sp. n., is described from Alaska, where it has caused considerable damage to wooden articles in a museum at Sitka and to the unpainted surfaces of the supporting columns of the building.

Cushman (R. A.). **A new European Species of *Epiurus*, parasitic on a Leafmining Sawfly (Hymenoptera : Ichneumonidae).**—*J. Wash. Acad. Sci.* **28** no. 1 pp. 27–28, 1 fig. Menasha, Wis., 15th January 1938.

A description is given of the Ichneumonid, *Pimpla* (*Epiurus*) *foliac*, sp. n., reared from the mines of *Phyllotoma nemorata*, Fall., in leaves of birch. It was originally bred in Europe (Austria being given as the type locality), but has been imported into the United States, reared there and released in areas in New England infested by the host.

Smith (S. G.). **Cytology of Spruce Sawfly and its Control in eastern Canada.**—*Nature* **141** no. 3559 p. 121. London, 15th January 1938.

In view of the fact that parthenogenesis in the Canadian form of *Diprion polytomum*, Htg., on spruce, which spins cocoons and usually diapauses beneath débris, leads almost exclusively to the production of female offspring [*cf. R.A.E.*, A **24** 316, 658], the males, which number about 1 in 1,200, being sexually almost functionless, while in the European form, which usually pupates without a diapause in the lower foliage or herbaceous growth above ground, it leads to males [*cf.* **23** 236], cytogenetic investigations were carried out on individuals of both sexes collected in Canada and in Czechoslovakia. In European males and females there were 6 and 12 chromosomes, respectively, while in the Canadian form there were 7 and 14. The processes of spermatogenesis and oogenesis are briefly described. In a laboratory investigation to discover whether both forms occur in Europe, larvae bred from 36 unfertilised eggs deposited by females from 5 bioclimatically different regions in Czechoslovakia spun small cocoons in foliage ; all gave rise to males, of which 2 from different females each had 6 chromosomes. An unfertilised female from another region, however, gave rise to 13 larvae that have made large cocoons buried beneath débris and have gone into diapause. These are presumably females, so that it appears that a strain similar to the Canadian exists in Europe. The investigations are still proceeding.

Felt (E. P.) & Chamberlain (K. F.). **The Occurrence of Insects at some Height in the Air, especially on the Roofs of High Buildings.**—*Circ. N. Y. St. Mus.* no. 17, 70 pp., 4 figs., 3 refs. Albany, N.Y., December 1935. [Recd. December 1937.]

A briefly annotated list is given of about a thousand different species of insects collected in 1927 at stations on the tops of 5 high buildings in New York. They represent a wide variety of groups and include several species new to the state and one recorded for the first time in North America. The species of economic importance included : *Leptinotarsa decemlineata*, Say, which, as it was common, would appear to fly habitually at some height ; the clover weevils, *Hypera punctata*, F., and *H.* (*Phytonomus*) *meles*, F. ; *Anthophila* (*Hemerophila*) *pariana*, Clerck, which was also common and so was probably following a general air-drift ; the Jassid, *Acucephalus albifrons*, L., which is largely subterranean ; *Chermes* (*Adelges*) *abietis*, L., which must have drifted one or two miles from the nearest wood ; and *Aserica castanea*, Arrow. From these records it would appear that widespread and

general drifting is the most probable means of dissemination of certain species in America [*cf. R.A.E.*, A **25** 374]. Such insects as *Porthetria dispar*, L., *Pyrausta nubilalis*, Hb., *Popillia japonica*, Newm., and *Platyedra* (*Pectinophora*) *gossypiella*, Saund., all of which are or have been the subject of federal quarantines, may drift for long distances in moderately high air-currents, so that it may be necessary to reconsider and modify quarantines on these grounds.

MARCOVITCH (S.), SHUEY (G. A.) & STANLEY (W. W.). **Cryolite Spray Residues and Human Health.**—*Bull. Tenn. agric. Exp. Sta.* no. 162, 46 pp., 6 figs., 5 pp. refs. Knoxville, Tenn., November 1937.

An account is given of experiments in which rats were given water containing cryolite and other fluorine compounds and food cooked in such water. The results indicate that fruits or vegetables sprayed with fluorine cannot bear quantities injurious to health. The fact that poisons are more toxic in liquids than in foodstuffs was verified in the case of fluorine. On these grounds, the validity of the present tolerance of 0·01 grain fluorine per lb. foodstuffs is contested; it is suggested that the tolerance should be 0·1 grain. In connection with an examination of the possible causes of the relatively great susceptibility of insects to fluorine poisoning, an analysis was made of larvae of *Leptinotarsa decemlineata*, Say; they were found to have less than one part of flourine per million parts body weight, whereas mammals have 40–50 parts per million. The calcium and phosphorus contents were also small in comparison with those of mammals.

HYRE (R. A.). **The Effect of several Sulphur Sprays on the Photosynthesis of Apple Leaves in a controlled Environment. (Abstract.)**—*Phytopathology* **28** no. 1 p. 10. Lancaster, Pa, January 1938.

In tests on leaves of apple, lime-sulphur solution reduced photosynthesis much more than did either of two forms of wettable sulphur. The reduction was greater when the spray was applied to the lower or to both surfaces of the leaves than when it was applied to the upper surface only. It is probable that the marked increase in injury of apple foliage of recent years may be due to the change in the method of application from overhead applications with nozzles on spray rods to heavy driving applications from the ground with spray guns.

JOHNSON (H. W.). **Further Determinations of the Carbohydrate-nitrogen Relationship and Carotene in Leaf-hopper-yellow and Green Alfalfa. (Abstract.)**—*Phytopathology* **28** no. 1 p. 10. Lancaster, Pa, January 1938.

A congestion of carbohydrates in the leaves and a deficiency of these substances in the stems of lucerne plants yellowed by *Empoasca fabae*, Harr. [*cf. R.A.E.*, A **25** 37] are considered further evidence that the injury caused by this leafhopper is due to a clogging of the food-conducting elements with resultant interference with the translocation of elaborated food in the infested plants. In 1937, the leaves and stems of leafhopper-yellow, second-cutting lucerne contained only 71 mg. carotene per kg. dry matter, while green lucerne from a caged area in the same small plot contained 227 mg.

Leach (J. G.) & Decker (P.). **A Potato Wilt caused by the Tarnished Plant Bug,** *Lygus pratensis* **L. (Abstract.)**—*Phytopathology* **28** no. 1 p. 13. Lancaster, Pa, January 1938.

Investigations on a destructive wilt of potato observed in Minnesota since 1935 showed that it was probably caused by *Lygus pratensis*, L., which was abundant in affected fields. When nymphs and adults were allowed to feed for about 2 weeks on the stems of potato, a characteristic wilt comparable with that observed in the field was produced. About 3 weeks after the bugs were removed, a marked chlorosis appeared on the terminal leaves, though the bugs fed only on the stems. The stems wilted about 10 days after the appearance of the first symptoms on the leaves.

Swank (G. R.). **Tomato Pin Worm** (*Gnorimoschema lycopersicella* (**Busck**)) **in Florida.**—*Florida Ent.* **20** no. 3 pp. 33–42, 1 ref. Gainesville, Fla, November 1937.

This summary of a report on the tomato pin worm, *Phthorimaea* (*Gnorimoschema*) *lycopersicella*, Busck, in Florida includes an account of investigations on its bionomics carried out in the laboratory from 1st April to 30th June 1937. Estimates of the duration of the 4 instars under experimental conditions in May gave an average larval stage of 10·35 days. In mid-April, when the temperature averaged 69·6°F., the pupal stage in individuals collected as larvae varied from 9 to 16 days, with an average of 10·5, while in the following generation at 79·8°F., the averages for males and females were 9·11 and 8·24 days, respectively. The durations of the several stages in early summer are compared with those obtained in California [*cf. R.A.E.*, A **23** 758]. At the end of June, the life-cycle was completed in 21 days.

Females paired and began to oviposit on the day after emergence. Oviposition continues through adult life, which lasts 6–25 days without food and probably longer if nourishment is taken. The average number of eggs laid by fertilised females was 36·1, and the maximum 138. Unfertilised females deposited very few eggs, and these were not viable.

In experiments, larvae fed only on solanaceous plants and were only able to complete their development on 9 out of 20 plants of this family. Those on which they fed successfully included potato and egg-plant, but not all species of *Solanum*. Larvae fed on tomato petioles failed to pupate, and those fed on green tomatos gave rise to very few adults. Larval attack on the fruits at points of contact with the calyx [*cf.* **19** 654] or adjacent leaves seems therefore not to be due to a preference for the fruit, but this is not borne out by field observations. A few adults succeeded in emerging from pupae and cocoons buried ½ in. in dry or moist sand, but these were scarcely able to fly.

Numerous unidentified parasites were reared from the material collected, especially that from foliage.

Romm (H. J.). **The Insect Depredators of Purslane** (*Portulaca oleracea* **L.**).—*Florida Ent.* **20** nos. 3–4 pp. 43–47, 51–61, 155 refs. Gainesville, Fla, November–December 1937.

The author briefly discusses the beneficial and harmful relationships between insects and weeds, and gives a list of 83 species of insects

that feed on purslane (*Portulaca oleracea*), showing the parts of the plant attacked by them, the authorities for the records that are based on the literature, and the abundance of the insects observed by himself in the United States.

Biennial Report of the Rice Experiment Station, Crowley, Louisiana 1935–36.—19 pp. Baton Rouge, La, 1937.

A section of this report entitled Rice Field Insects (pp. 12–13), by W. A. Douglas, includes a brief account of investigations on the Pentatomid, *Solubea pugnax*, F., which causes a discolouration of rice kernels known as "pecky rice" [*cf. R.A.E.*, A **25** 411]. Surveys showed that it breeds readily on *Paspalum urvellei*, a grass common round rice-fields, and migrates to rice when the kernels reach the milk and dough stage. The discolouration is caused partly by the feeding of the bugs and partly by disease organisms that subsequently enter by the punctures. Infestation of rice by *Diatraea saccharalis*, F., and *Chilo plejadellus*, Zinck., was greater than the average, which is nearly 7 per cent. injured stalks. Two types of damage are caused; in the first or whitehead type the panicle emerges in an injured condition because the larva has bored in the stalk prior to heading, and in the second type the stalks fall or are blown over because the young larvae have weakened them by gnawing round the nodes of the stems.

C. L. Stracener, in Insect Control in stored Rice (pp. 16–19) gives data to show that insects remaining in warehouses that are not cleaned are of more importance in the infestation of the new crop than those brought in with it from the field. The rice weevil [*Calandra oryzae*, L.] begins to increase early in the spring, the angoumois grain moth [*Sitotroga cerealella*, Ol] increases in late spring and early summer but not in the very hot weather, and the lesser grain borer [*Rhizopertha dominica*, F.] throughout the warm season. Tests showed that 6 oz. derris mixed with 100 lb. rice before sacking killed all insects and had a considerable repelling effect. It cannot be used with milled rice, as the stain from the derris cannot be washed out. When derris was dusted on the outside of bags of rice, infestation was less than 1 per cent. after 8 months. A recommended programme of control consists of burning all straw sacks before 1st June, and eliminating all insects from the warehouses before 15th June by cleaning, fumigation and spraying walls and floors with a contact insecticide (equal parts of kerosene and fuel oil). The most efficient types of bags for the storage of milled rice are discussed. Promising results were given by storage in bags of five-ply paper, the middle layer of which was treated with a compound thought to have repellent properties.

Friend (R. B.) & Carlson (A. B.). **The Control of Carpenter Ants in Telephone Poles.**—*Bull. Conn. agric. Exp. Sta.* no. 403 pp. 913–929, 6 figs., 5 refs. New Haven, Conn., October 1937.

Experiments are described on the control of *Camponotus herculeanus pennsylvanicus*, DeG., in telephone poles in Connecticut by injecting insecticides or poison baits into the top of the cavities made by it. Tests were carried out from 1933 to 1937 on 70 chestnut telephone poles known to be infested. The most satisfactory procedure was to force the insecticides into the cavity made by the ants with a modified form of "oil gun" (such as is used by motor mechanics), the tip of

which was inserted into the top of the cavity through a hole bored in the side of the pole. After varying periods, the poles were removed and cut open for examination. Good results were given by a mixture of equal volumes of coal-tar creosote with either petrol or a " refined " creosote, a commercial product advocated for use where the stain of ordinary creosote is not desired and where the wood is to be painted. Creosote alone did not disperse well through the galleries and petrol alone volatilised too quickly. The mixture evidently has a fumigant action, as dead ants were found in galleries where no stain of creosote was visible. A bait containing thallium sulphate also gave promising results, but the creosote mixtures were more effective and easily handled. Of the other materials tested, carbon bisulphide solutions of naphthalene and paradichlorobenzene gave fairly good results; baits containing tartar emetic or sodium arsenite, paradichlorobenzene in petrol, a calcium cyanide dust, orthodichlorobenzene, decahydronaphthalene and steam-distilled pine oil all gave unsatisfactory results. Poles with cavities extending more than 7 ft. above the ground should be replaced as the results of treatment are uncertain. Not less than 1 U.S. pt. material should be injected into cavities 4 ft. or less in length, and not less than 2 U.S. pts. into longer cavities. No re-infestation has occurred in successfully treated poles within two years of the time of treatment, but if a new colony should become established, serious injury would not be perceptible until three years after treatment. Much injury is avoided by inspection of poles every three years.

LIGHT (S. F.). **Contributions to the Biology and Taxonomy of** *Kalotermes* (*Paraneotermes*) *simplicicornis* **Banks (Isoptera).**— *Univ. Calif. Publ. Ent.* **6** no. 16 pp. 423–463, 3 pls., 18 refs. Berkeley, Calif., 1937.

Calotermes simplicicornis, Banks, the desert dampwood termite of the south-western United States and northern Mexico, is the only species of the family CALOTERMITIDAE that has essentially subterranean habits, and it has a very unusual fauna of intestinal Protozoa. Descriptions are given of the alates, soldiers, supplementary reproductives and nymphs, and the species is placed in a distinct subgenus, *Paraneotermes*, which is here described as new, but of which some of the characters were indicated in one of the author's papers in a work already noticed [*R.A.E.*, A **22** 254]. The distribution of this termite is discussed, and a detailed account is given of experimental and field studies on its habits. In California, it has attacked and sometimes killed grapefruit and tangerine trees a few months after planting. The trees and roots were cut clear across in 1–4 places, each attack being below the ground and begun from the outside.

The following is taken from the author's summary of the biology, which is partly hypothetical: Although *C. simplicicornis* extends its range into the arid and desert areas beyond the limits of any other termite of its family, it does so not by adaptation to aridity, but by confining its activity to wood containing much moisture. It differs in this respect from the dry-wood termites, and resembles, rather, the damp-wood termite of the Pacific coast (*Zootermopsis*). It obtains the requisite amount of moisture by confining itself to wood below ground, usually to that extending for some distance below the surface, or by living on partly living plants. Although it presents in many ways the facies of a wood-dwelling termite, it nevertheless exhibits

numerous aspects of behaviour essentially subterranean. All castes readily, rapidly and effectively penetrate soft, fine, damp soil (dune sand). (The practical limitation of such soils to desert areas may possibly explain the limitation of range of the species.) Relatively permanent runways are constructed through sand. The colonising pairs are unable to enter sound wood, and enter earth in preference to wood. Under certain conditions, runways have been found leading through the soil to wood attacked. Colonies in wood differ from those of wood-dwelling termites in that no eggs, first instar nymphs, supplementaries, or, except in one instance, primary reproductives have been found. It is assumed, therefore, that these so-called colonies are really outlying foraging subcolonies, maintaining connections with a central reproductive centre, probably situated in decaying wood deep in moist soil.

EDWARDS (W. H.). **Progress Report on Damage done in the Kingston and St. Andrew Area by Termites which infest Buildings.** —*Bull. Dep. Sci. Agric. Jamaica* no. 10 (N. S.), 11 pp. Kingston, 1937.

Damage to buildings by termites has increased markedly in recent years in Jamaica, partly owing to the increasing scarcity of native hardwoods and the substitution in construction of susceptible imported timber. The species concerned comprise tree-nesting, subterranean and dry-wood termites, and the damage done by each group is briefly described. The dry-wood termites are the hardest to eradicate, and include *Calotermes* (*Cryptotermes*) *brevis*, Wlk., which is considered the most destructive of all timber-infesting species in Jamaica. Standard measures for the prevention and control of infestation are described in an appendix.

WATERSTON (J. M.). **Cedar Disease Survey.**—*Agric. Bull. Bermuda* **16** no. 10 pp. 50–55. Hamilton, 1937.

In the course of a survey conducted throughout the Bermudas in 1937 on a supposed disease causing the browning and dropping of the leaves of Bermuda cedar (*Juniperus bermudiana*), the condition was found to be due in one locality partly to a severe infestation of *Chrysomphalus agavis*, Tns. & Ckll. [*cf. R.A.E.*, A **25** 786] and partly to overcrowding and neglect. The condition of the trees was improved by spraying with lime-sulphur and oil emulsion combined with pruning. Brief notes are given on other insect pests of Bermuda cedar [*cf.* **24** 137]; the most injurious is *Calotermes castaneus*, Burm., but infestation by it can be largely prevented by care in pruning and treatment of any injuries to the trees [*cf.* **25** 754].

WATERSTON (J. M.). **The Termite Menace.**—*Agric. Bull. Bermuda* **16** no. 12 pp. 67–69, 1 ref. Hamilton, 1937.

In addition to attacking living trees [*cf.* preceding paper, etc.], *Calotermes castaneus*, Burm., has now been found invading the woodwork of buildings in Bermuda through cracks, crevices and unprotected surfaces. All kinds of timber are attacked, oak being especially susceptible. Infestation may to some extent be prevented by impregnating the wood with chemicals.

CLEARE (L. D.). **Experimental Rearings of the Amazon Fly** (*Metagonistylum minense* **Towns.**) **on the Yellow-headed Sugar-cane Moth-borer** (*Diatraea canella* **Hmpsn.**).—*Agric. J. Brit. Guiana* **8** no. 4 pp. 190–194. Georgetown, December 1937.

Since *Metagonistylum minense*, Tns., has been introduced into British Guiana for the control of *Diatraea* on sugar-cane [*R.A.E.*, A **22** 388, etc.] it has parasitised *D. saccharalis*, F., much more heavily than *D. canella*, Hmps. Moreover, the percentage of successful parasitism obtained by artificial infestations with larvae of the fly [*loc. cit.*] has been far higher in *saccharalis* than in *canella*. Experiments were carried out for 11 months from February 1936 to determine whether a strain could be reared that would give an increased percentage of parasitism in the latter species. Starting with parasites obtained from *canella* larvae collected in the field, 3 distinct family groups were reared through 10 generations, and 6,795 *canella* larvae were artificially infested. The mean percentage of successful parasitism in the 3 groups for all generations averaged 3·7, and statistical analysis showed that the differences between generations and those between families were not significant. In field surveys, it was also found that there was no increase in *canella* parasitism. Although the ratio of *canella* : *saccharalis* larvae averaged 3 : 1 and was occasionally 7 or 8 : 1, the percentage parasitism of *saccharalis* in 39 fields averaged 12·8 and that of *canella* only 0·2.

CANTO (J. P.). **Observaciones sobre el uso del quillay para combatir los cóccidos y áfidos.** [Observations on the Use of Soap-bark for the Control of Coccids and Aphids.]—*Rev. Univ. Santiago* **22** no. 1 pp. 131–132. Santiago de Chile, 1937.

Good control of *Epidiaspis leperii*, Sign. (*piricola*, Del G.) and *Lepidosaphes ulmi*, L., on apples and pears in Chile has been obtained with a spray consisting of tobacco powder, bark of the soap-bark tree [*Quillaia saponaria*], sodium carbonate and water, in the proportion of 6 : 2 : 0·2 : 100 by weight. The bark is boiled with the soda and water, and the mixture poured on to the tobacco. Trees treated with lime-sulphur (5°Bé.) during the winter and with the soap-bark spray in October, before the larvae had formed their scales, showed only very slight traces of attack later in the season. Two applications of lime-sulphur (5 and 0·5°Bé.) gave only 50 per cent. control.

TUCKER (R. W. E.). **Report on the Entomological Section** [*Dep. Sci. Agric. Barbados*] **for the Year ending 31st March, 1937.**—*Agric. J. Barbados* **6** no. 2 pp. 74–82. Barbados, April 1937. [Recd. January 1938.]

The total loss of sugar-cane from *Diatraea saccharalis*, F., in Barbados [*cf. R.A.E.*, A **25** 42] was estimated at 9 per cent. of the crop reaped in 1937, this being the lowest figure since records were started in 1929, and the average number of internodes bored, calculated from samples taken at the factories, was 17·7 per cent. Infestation in the coastal areas of black soil has increased as a recently established variety (B. 2935) has replaced one with a much lower internodal infestation ; nevertheless the average infestation for all canes indicates a reduction in the population of the borer, while the maximum recorded indicates

that extensive damage is still possible in the absence of control measures. As the total loss due to *D. saccharalis* is now less than half the original figure, the liberations of *Trichogramma* are considered to be a commercial success; nearly 160 million parasites were liberated in 1936. Totals of 3,109,600 adults and 213,660 egg-masses of the sugar-cane root borer, *Diaprepes abbreviatus*, L., and 8,299,300 adults of *Lachnosterna smithi*, Arr., were collected from June to October 1936. The introduced predator, *Pyrophorus luminosus*, Ill., was seen in small numbers in the adult stage and was reported to be present in the larval stage. The most serious check to artificial breeding of *Bufo marinus*, the toad predatory on sugar-cane insects, was the occurrence in the ponds of predacious larvae of large Dytiscid beetles, which exterminate the tadpoles.

Defoliation of cotton by *Alabama argillacea*, Hb., was so severe in some districts that the plants died or the cotton was not worth picking. Tests showed that it can be controlled at an economic cost by regulated dusting with Paris green and lime. Infestation by *Platyedra gossypiella*, Saund., was again serious in the area where there was the greatest acreage under cotton, probably owing to the invalidation of the close season by an experimental planting of cotton for varietal and manurial trials. The adult moths emerged over a period of 3½ months from bolls taken from fields cleared in late April 1936. Infestation of sweet potato by *Euscepes batatae*, Waterh., is spread by the use for propagation of slips infested by eggs or larvae. In experiments, the average yield of uninfested tubers from plots of the same size was 33·6 lb. for untreated plants from infested slips, 67·8 lb. for untreated plants from uninfested slips, and 115·8 lb. for plants grown from infested slips but sprayed three times with 2 oz. lead arsenate plus molasses in 4 gals. water, and infestation varied inversely with the yield. Other pests of sweet potato observed during the year were a thrips, possibly *Frankliniella* (*Euthrips*) *insularis*, Frankl., which can be controlled by destroying infested slips or newly rooted vines and spraying the rest of the plants with a preparation containing sulphur and oil, and the Eumolpid, *Myochrous armatus*, Baly, which girdles and kills the young vines or newly planted slips.

Wolcott (G. N.). **Annual Report for the Fiscal Year 1934–1935. Division of Entomology.**—*Rep. Univ. P. R. agric. Exp. Sta. 1934–35* pp. 41–49. S. Juan, P.R., 1937.

Wolcott (G. N.). **Annual Report . . . 1935–1936 of the Division of Entomology.**—*Op. cit. 1935–36* pp. 53–64.

Part of the information given in these two annual reports of work on insect pests and biological control in Porto Rico has already been noticed [*R.A.E.*, A **23** 713; **24** 785; **25** 441, 570]. For the control of *Myrmelachista ambigua ramulorum*, Wheeler, nesting in trees in and near coffee plantations [*cf.* **13** 134], mixtures of minced steak and ground salt pork in equal parts with 25 gm. thallium nitrate to 2 lb. meat were made in November 1934. The baits were placed in the trees, and the ants ate them so rapidly that it was not possible to test the keeping qualities of a portion of the meat to which benzoic acid had been added, but in the can, meat so treated does not mould in a month. Additional applications were made in December 1934 and January 1935, but the bait was not eaten so rapidly as before. In an attempt to destroy all the ants with one application, mixtures of

1 lb. steak, 1 lb. salt pork and 50 gm. thallium acetate, and 1 lb. steak, ½ lb. salt pork and 50 gm. thallium acetate or nitrate were tried, but no treatment killed all the ants. Some remained inside the trees. In April 1935, the ants had ceased to be attracted to meat, but readily ate a mixture of 10 gm. thallium nitrate and ¼ lb. ground codfish flakes and gelatine. Early in June, they readily ate unpoisoned meat, but not poisoned meat. It appears that finely ground meat bait is completely effective against ants living in the part of the trees to which it is applied, but does not affect ants in the higher branches, and that the latter will occupy the trunk when the former have been killed. Applications of bait were made very high up in 1935–36 and resulted in the total disappearance of lines of descending ants on the trunk. Fish oils all proved repellent. As thallium injured the bark of several trees, including *Inga vera* and *I. laurina*, experiments were made with waxed paper cups, but these were not completely successful, as when not full, they were blown from the trees and several domestic animals were poisoned. No improvement on the bait of 1 part salt pork and 2 parts steak with a soluble compound of thallium was noted.

Although no recoveries have been made of *Hyperaspis trilineata*, Muls., which was imported from Barbados [**24** 436], mealybugs were so scarce in 1934–35 in the sugar-cane fields where the Coccinellids had been liberated that it seemed that they must have eaten those available and dispersed. *Rodolia cardinalis*, Muls. [*cf.* **24** 259], of which a good supply was maintained in the laboratory for distribution against *Icerya purchasi*, Mask., is now established in Porto Rico and reached a newly infested area by its own efforts. A study of the parasites of *Leucoptera coffeella*, Guér., which is being made by F. Seín jr. indicates that little control may be expected from any of the parasites already present, as parasitism is only considerable at low elevations and the coffee groves are on the mountains. It was found that most of the species occurring in Haiti also occurred in Porto Rico, and that the scarcity of the leaf-miner in Haiti is not due to the activity of parasites but to the age of the trees, their environment and the climate.

Investigations are being made on *Calotermes* (*Cryptotermes*) *brevis*, Wlk., which is destructive to structural timber. Crystals of para-dichlorobenzine and a liquid mixture of ethylene dichloride and carbon tetrachloride appeared to be effective in killing it in books, pictures and other small objects that can be enclosed in a tight container. Paring and sterilisation of banana corms to free them from *Cosmopolites sordidus*, Germ. [**23** 112] were shown to be commercially practicable. The possibility of controlling *Cylas formicarius*, F., by planting only the tips of sweet-potato vines was investigated in 1935–36. Infestation was found to depend, not on the selection of the tips but on the soil and the rainfall. Heavy infestations developed in tubers growing in inferior soil, subject to drying out and cracking.

A search for parasites of *Scapteriscus vicinus*, Scud., in Trinidad was unsuccessful, but *Larra americana*, Sauss., was found attacking it in Brazil, and 25 out of 78 adults survived the journey to Porto Rico and were liberated. It is not known whether they survived the drought; this Sphegid normally passes the dry season as a pupa in a cocoon, deep in the soil. It is proposed to make weekly shipments from Brazil to the irrigated areas.

[Moore (R. H.).] **Investigations of Insecticidal Plants.**—*Rep. P. R. Exp. Sta. U. S. Dep. Agric. 1936* pp. 72–74. Washington, D.C., August 1937.

In preliminary tests in Porto Rico of the content of rotenone and certain related substances of 29 introduced and 18 indigenous plants employed as fish-poisons, a positive reaction to the Durham test was given by the freshly cut tissue of 8 species, *viz.*, *Tephrosia candida*, *T. cinerea*, *T. noctiflora*, *T. toxicaria*, a species of *Tephrosia* from the Dominican Republic, *Derris elliptica*, *Lonchocarpus nicou* and *Aeschynomene sensitiva*. Positive reactions were also given by seeds of *A. sensitiva* and of all the species of *Tephrosia*, and very strongly by roots of *L. nicou*, *D. elliptica* and *T. toxicaria*. From the growth response of the plants in the local environment, however, it appears probable that only *D. elliptica* and *T. toxicaria* are likely to become commercial crops in Porto Rico.

During the propagation of these plants, leaves of *D. elliptica* were attacked by *Lamprosema indicata*, F., and *Proteides mercurius pedro*, Dewitz, pods of *T. candida* and *T. toxicaria* by *Brachyacma palpigera*, Wlsm., and pods of *T. toxicaria* by *Etiella zinckenella*, Treit.

Back (E. A.). **Silverfish.**—*Leafl. U. S. Dep. Agric.* no. 149, 4 pp., 3 figs. Washington, D.C., October 1937.

At least two species of silverfish infest houses in the United States. These are *Lepisma saccharina*, L., and *Thermobia domestica*, Pack. Notes are given on their life-history [*R.A.E.*, A **19** 577; **23** 238], but a thorough study of their biology has not been made. For control, a bait composed of 100 parts by weight oatmeal flour, 8 parts white arsenic, 5 parts granulated sugar and 2·5 parts salt is recommended. Sodium fluoride powder can be substituted for the arsenic [**24** 539]. The bait is mixed dry, moistened and stirred to bind the ingredients together, and then dried and ground into small pieces. It is best distributed in shallow cardboard boxes, each loosely covered with a crumpled sheet of paper.

Adams (J. A.). **The Firebrat, *Thermobia domestica* (Packard), and its gregarine Parasites.**—*Iowa St. Coll. J. Sci.* **11** no. 1 pp. 23–25, 3 refs. Ames, Iowa, October 1936.

Adams (J. A.). **Temperature Preference of the Firebrat, *Thermobia domestica* (Packard). (Thysanura).**—*T.c.* no. 3 pp. 259–265, 2 figs., 5 refs. April 1937. [Recd. 1938.]

Investigations carried out at Iowa State College on *Thermobia domestica*, Pack. [*cf. R.A.E.*, **23** 238] showed that its range of preferred temperatures was 32–43°C. [89·6–109·4°F.], the mean point of distribution in the thermogradient being at 37·5°C. [99·5°F.]. Development was very slow at 29·5°C. [85·1°F.] and did not take place at 24·5°C. [76·1°F.]. Oviposition occurred at 42°C. [107·6°F.] but not at 45°C. [113°F.]. The durations of the egg stage at 37 and 42°C. [98·6 and 107·6°F.] were not less than 13 and 9 days, respectively, and at the latter temperature the cycle from egg to egg was a month shorter than at the former [*loc. cit.*]. Almost all nymphs and adults died in 1 hour at −7°C. [19·4°F.] and in less than 24 hours at 2°C. [35·6° F.]

Two Gregarines were observed to be numerous in cultures of *T. domestica*.

The second paper contains a detailed account of the apparatus with which the results were obtained. In later experiments, the mean point of distribution was 38·5°C. [101·3°F.].

ELLISOR (L. O.). **A toxicological Investigation of Nicotine on the Goldfish and the Cockroach.**—*Iowa St. Coll. J. Sci.* **11** no. 1 pp. 51–53. Ames, Iowa, October 1936. [Recd. 1938.]

In investigations on the comparative toxicity to *Periplaneta americana*, L., of nicotine and nicotine sulphate, 0·05 cc. of solutions of the same molar concentration of nicotine were injected into the body cavity at 23°C. [73·4°F.]. Whether the criterion was death or paralysis and subsequent recovery, no differences in toxic action were observed.

ANDRE (F.). **An undescribed Chinch Bug from Iowa.**—*Iowa St. Coll. J. Sci.* **11** no. 2 pp. 165–167, 1 pl. Ames, Iowa, January 1937. [Recd. 1938.]

Descriptions are given of both sexes of *Blissus iowensis*, sp. n., taken in association with *B. leucopterus*, Say, on *Andropogon furcatus* in Iowa during the winter of 1935–36.

TATE (H. D.). **Method of Penetration, Formation of Stylet Sheaths and Source of Food Supply of Aphids.**—*Iowa St. Coll. J. Sci.* **11** no. 2 pp. 185–206, 8 pls., 9 refs. Ames, Iowa, January 1937. [Recd. 1938.]

Investigations on 15 species of Aphids killed and preserved on their food-plants showed that in general the main objective of the setae is the vascular bundle. The setae of *Aphis rumicis*, L., and *Myzus persicae*, Sulz., followed an intercellular path, except in a few instances, whereas those of *Prociphilus fraxinifolii*, Riley, *Periphyllus negundinis*, Thos., and *Carolinaia* (*Hysteroneura*) *setariae*, Thos., followed a direct path. The other species tested penetrated both inter- or intracellularly, although the intercellular penetration was commoner. Notes are given on the stylet sheaths and their formation, and on histological abnormalities associated with Aphid feeding.

ANDRE (F.). **Studies on Brood A June Beetles in Iowa.**—*Iowa St. Coll. J. Sci.* **11** no. 3 pp. 267–280, 12 refs. Ames, Iowa, April 1937. [Recd. 1938.]

Observations were carried out in the summer of 1935 on the adults of brood A of *Lachnosterna* (*Phyllophaga*) in 69 counties of Iowa [*cf. R.A.E.*, A **23** 4], where the beetles have a three-year life-cycle. Lists are given of the 26 species collected, showing their distribution and food-plants, the dates of observation, and the numbers taken, and of the 28 species that have been recorded as belonging to brood A. Of the 42,559 beetles taken, 22,143 were females. The most abundant species were *L.* (*P.*) *implicita*, Horn, *L.* (*P.*) *hirticula*, Knoch, and *L.* (*P.*) *rugosa*, Melsh. *L.* (*P.*) *hirtiventris*, Horn, was recorded for the first time in Iowa. Most individuals were taken on elm, willow and poplar, but in some districts these were the only food-plants available for sampling.

Tests were made in June 1935 with dusts applied to willow trees against *L. implicita* to discover whether insecticides that had proved

toxic in the laboratory [**23** 5 ; **24** 690, 691] would give control under field conditions. The insecticides used were Paris green, acid lead arsenate, calcium arsenate and sodium fluosilicate, each mixed with bentonite in the ratio of 2 : 3 by volume, and the dusts were applied at about 5 p.m. The beetles usually migrated to the trees at about 8.30–9 p.m. and began to feed. General observations showed that sodium fluosilicate was ineffective, while calcium arsenate repelled about 10, and the other two dusts about 66 per cent. of the beetles in 2 hours. Beetles collected from the trees after they had finished feeding were taken to the laboratory, where after 96 hours the percentage mortalities of females that had fed on Paris green, lead arsenate and calcium arsenate were 93·4, 97·1, and 76·8, respectively. Mortality in the controls was 5·5 per cent. Mortality was of the same order, although lower, when the beetles were collected after feeding for 4 hours. Laboratory investigations showed that the percentages of females that refused leaves treated with Paris green, acid lead arsenate or sodium fluoride were 36·8, 28·1 and 41·2, respectively.

Lange jr. (W. H.). **An annotated List of the Insects, mostly Coleoptera, associated with Jeffrey Pine in Lassen National Forest, California.**—*Pan-Pacif. Ent.* **13** no. 4 pp. 172–175. San Francisco, Calif., October 1937.

This paper comprises a list of some 60 insects, mostly Coleoptera, that were found attacking Jeffrey pine [*Pinus jeffreyi*] at an altitude of 5,500–6,500 ft. in a forest reserve in California in June 1935. They are arranged according to the part of the tree they attack, and notes are given on their frequency. A list is also given of 15 predacious insects that were found in association with them.

McKenzie (H. L.). **Generic Characteristics of *Aonidiella* Berlese and Leonardi, and a Description of a new Species from Australia (Homoptera-Diaspididae).**—*Pan-Pacif. Ent.* **13** no. 4 pp. 176–180, 1 fig., 5 refs. San Francisco, Calif., October 1937.

The characters distinguishing the genera *Aonidiella* and *Chrysomphalus* are discussed, and *A. eremocitri*, sp. n., is described from females taken on *Eremocitrus glauca* in Queensland in 1931. A key to six species of *Aonidiella* is given.

Rau (G. J.). **Two apparently undescribed Mealybugs (Hemiptera : Pseudococcidae) from New York State.**—*Bull. Brooklyn ent. Soc.* **32** no. 5 pp. 195–201, 1 pl. Lancaster, Pa, December 1937.

Descriptions are given of the adult female of *Phenacoccus saratogensis*, sp. n., from a grass (*Hystrix patula*) in New York, and the first- and third-stage larvae and adult female of *Pseudococcus cuspidatae*, sp. n., from *Taxus brevifolia*. Characters by which they can be distinguished from allied species are discussed. *P. cuspidatae*, which has previously been recorded as *P. kraunhiae*, Kuw. [*R.A.E.*, A **4** 72, 198], has been collected in New Jersey, Connecticut and New York and is probably widely distributed over the north-eastern part of the United States. In north-eastern New Jersey, it is very abundant on *T. brevifolia*, and the adults also occur on apple, maple, rhododendron, and other plants. The first-stage larvae overwinter in crevices in the bark or beneath the waxy secretions left by the adults of the preceding

year. In the first warm days of 1936, in the third week of March, they became active and migrated to the smaller branches to feed. Males were observed in large numbers in mid-May when the third-stage larvae were present. The adult females migrated to the thicker limbs and forks of the trees before they reproduced. Larvae of the first generation were first seen at the beginning of July when observations in New Jersey were discontinued. Both larvae and adults occurred in New York in mid-August but the latter gradually disappeared in early September.

Dawsey (L. H.) & Hiley (J.). **Improvements in Determination of Oil Deposit on sprayed Foliage.**—*J. agric. Res.* **55** no. 9 pp. 693–701, 8 refs. Washington, D.C., 1st November 1937.

The following is taken from the authors' summary: An improved weighing method is described for determinations of oil deposit on chrysanthemum foliage after spraying with emulsions. The method is applicable to nearly all kinds of non-volatile insecticidal oils, including both petroleum oils and fatty oils. The procedure consists of four steps: cutting leaf disks in preparation of samples; extracting samples; evaporating the solvent; and drying the residues to constant weight. Recovery of oil from chrysanthemum foliage is 100 per cent. Petroleum ether was found to be the most suitable solvent to use in extraction, because it dissolved smaller quantities of the natural plant substances present on the foliage than other solvents tested. All the oil could not be extracted by simply washing disks a limited number of times, but when samples contained freshly cut disks and extraction was carried out in a standard type of apparatus for 2 hours, recovery was complete. Drying and grinding the foliage before extraction was not necessary for complete recovery of deposit even 6 days after spray application.

Gahan (A. B.). **Two new Chalcidoid Egg Parasites (Eulophidae and Mymaridae).**—*Proc. ent. Soc. Wash.* **39** no. 9 pp. 266–269. Washington, D.C., December 1937.

Descriptions are given of both sexes of *Tetrastichus silvaticus*, sp. n., reared from eggs of *Malacosoma disstria*, Hb., in Minnesota, Vermont and New Brunswick, and of *Erythmelus psallidis*, sp. n., from eggs of *Psallus seriatus*, Reut., in Louisiana, Arizona, Arkansas, Mississippi and Texas.

Back (E. A.). **Two Types of Mothproofing Solutions.**—*Proc. ent. Soc. Wash.* **39** no. 9 pp. 269–282, 5 pls. Washington, D.C., December 1937.

In tests by the United States Bureau of Entomology and Plant Quarantine of moth-proofing solutions for protecting fabrics against *Tineola biselliella*, Humm., *Attagenus piceus*, Ol., and *Anthrenus vorax*, Waterh., the last-named has been used as the experimental insect, as it does not suffer from the high normal mortality that often vitiates results obtained with larvae of *T. biselliella*, and fabrics resistant to it were also protected against the latter.

Tests were made with samples of untreated cloth and cloth that had been treated with a solution of pentachloro-dioxy-triphenal-methane-sulphonic acid applied in the hot dye bath at the rate of 2 per cent. by weight of the dry woollen goods. One group of samples of the treated cloth had been dry-cleaned six times, another had been

washed in water and a neutral soap six times, a third had been washed in water and caustic soap six times, and two more had been weather-tested for 10 and 30 days, respectively. The samples were exposed to about 50 larvae of *A. vorax* and, after about 5 months, the only treated samples that showed any appreciable injury were those that had been washed with caustic soap. These showed slight injury in spots, but nowhere was the warp affected. In all of the untreated samples, however, pile and warp were both badly damaged and contained large holes. After 3 months on the treated cloths most of the larvae had died, but a few had developed into adults, which had laid many eggs. Larvae had hatched from all of these but had died without feeding, except a very few that had apparently fed on the bodies of other larvae. After 3 months on the untreated cloths, only a few insects had died, some were still in the larval and pupal stages, but most had developed into adults and laid eggs, all of which had produced larvae that were still healthy and feeding. When two pieces of cloth, each about 3 ft. square, were kept for about 12 months in an open closet where insects had access to them, all injury was confined to the untreated fabric. Similar results were obtained with various types of fabric, including woollen blankets.

Tests are also described of arsenical moth-proofing solutions, advertised commercially, which proved to be useless in the protection of woollen goods.

Donohoe (H. C.). **Fly Damage to drying cut Fruits.**—*Proc. ent. Soc. Wash.* **39** no. 9 p. 283. Washington, D.C., December 1937.

In June 1935, apricots in California were severely infested by flies during the process of drying. The species involved were *Musca domestica*, L., *Lucilia coeruleiviridis*, Macq., *L. sericata*, Mg., and *Cryptolucilia caesarion*, Mg., which sometimes completely covered the halves of apricots laid out to dry on the trays. The feeding of the flies occasioned a considerable loss of weight, and excreta deposited on the moist pieces at first mixed with the juice and later, on the formation of a film, became evident as spots on the surface. As many as 141 of these spots were observed on a single half of an apricot, and more than 5 were found on 77 and 92·6 per cent. respectively of the fruits from two drying yards. The flies were most abundant in yards near dairy barns and horse stables ; and complete freedom from infestation was obtained in one instance by moving a yard from a situation near a stable and a barnyard to a point about $\frac{1}{2}$ mile away. Conditions were similar during peach-drying in August, except that the flies were less abundant owing to the warm weather.

Back (E. A.). **House Ants.**—*Leafl. U. S. Dep. Agric.* no. 147, 8 pp., 5 figs. Washington, D.C., 1937.

This is a brief survey of the bionomics of the more common ants that invade houses in the United States and measures for their control ; 7 formulae for poison baits are given.

Service and Regulatory Announcements July–September 1937.—*S.R.A., B.E.P.Q.* no. 132 pp. 208–256. Washington, D.C., U.S. Dep. Agric., December 1937.

In an announcement (B.E.P.Q. 462) relating to the fruit and vegetable quarantine (no. 56) in the United States, the importation by permit and

under certain conditions is authorised of certain frozen fruits other than those that may enter in the fresh state. The fruits must be frozen solid either before or after packing for shipment and must be at a temperature of 20°F. or below at the time of arrival, when they must be inspected. Fruits may not be imported under these regulations if, in the area of origin, they are subject to attack by pests against which the treatment would not be completely effective. A circular (B.E.P.Q. 463) on the sterilisation of imported Vinifera grapes by refrigeration against the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.] restates with greater precision the provisions contained in a previous one (B.E.P.Q. 417) [*R.A.E.*, **25** 517], which it supersedes. Another circular (B.E.P.Q. 464) provides that the refrigeration treatment may be completed while the fruit is in transit provided that the grapes have been cooled to the proper temperature before loading in refrigerating holds in the vessels. Certain other deciduous fruits may be similarly treated. Before being loaded, the fruit must be cooled to 32°F. under official supervision, and the temperature must not exceed 33°F. between the time it is taken from the precooling plant and the beginning of required refrigeration treatment on the vessel. The fruit must be kept at 34°F. or below for 12 days. Such treatment may only be applied on vessels that have been approved by the Bureau of Entomology and Plant Quarantine, and under certain conditions of inspection, etc. Vinifera grapes or other deciduous fruits may be imported under the provisions of this circular throughout the year.

An announcement relating to Quarantine no. 52, against pink bollworm [*Platyedra gossypiella*, Saund.], provides for the issue of permits for the interstate movement of cottonseed to any destination from lightly infested areas if the cottonseed has been given a special heat treatment at 145°F. for 30 minutes, or if it has been heated to 155°F. in an approved manner separate and apart from ginning operations, and subsequent to either treatment has been protected from contamination.

Since 1915, circulars containing official information on the federal plant quarantines have been issued from time to time in a numbered series, many of the circulars containing information or instructions of a transitory nature. A recent circular (B.E.P.Q. 461) shows which of the preceding circulars are valid and which are obsolete.

Other matter in this part includes summaries of plant-quarantine restrictions issued by the Gambia, Nigeria (including the Cameroons under British mandate), Tanganyika, Nyasaland, Turkey, the Federated Malay States, China, Bermuda and Surinam; as well as amendments to summaries already noticed of restrictions issued by New Zealand, Dominica, the Dominican Republic, St. Vincent, France, Germany, and Jugoslavia.

REGNIER (R.). **Contribution à l'étude des** *Rhizotrogus* **nuisibles en Normandie.**—*Bull. Soc. Sci. nat. Rouen* **70–71** pp. 113–117. Rouen, 1936. [Recd. 1938.]

Considerable damage was caused to lawns in and near Rouen in the autumn of 1933 and spring of 1934 by *Amphimallus* (*Amphimallon*) *majalis*, Raz., *A.* (*A.*) *solstitialis*, L., and *Rhizotrogus aestivus*, Ol., which were injurious in that order. The adults of the three species are described. Observations on the bionomics of *A. majalis* showed

that it had one generation a year. The females oviposit on dry sandy soil, into which the larvae burrow. The larvae hibernate, resume activity early in March, and pupate in May. The adults emerge in the second half of June. Injury by the larvae was caused in Rouen exclusively in the neighbourhood of poplar trees.

WALLENGREN (H.). **Studier över vetemyggorna** (*Contarinia tritici* **Kirby och** *Sitodiplosis mosellana* **Géh.). II. Larverna i jorden.** [Studies on the Wheat Gall-midges, *C. tritici* and *S. mosellana*. II. The Larvae in the Soil.]—*Lunds Univ. Årsskr.* (N. F. Avd. 2) **33** no. 10 52 pp., 8 figs., 23 refs. Lund, 1937. Price *Kr.* 3. (With a Summary in German.)

This is the second part of a paper on the bionomics of *Contarinia tritici*, Kby., and *Sitodiplosis mosellana*, Géh., at Alnarp in Sweden [*cf. R.A.E.*, A **24** 347].

On leaving the ears of wheat, the larvae of both species burrowed into the ground within 1½–3 hours. On the following day they were found at a depth of 2 cm. From the time when they enter the ground in late summer or in autumn until they move towards the surface in spring, they are almost invariably enclosed in thin transparent cocoons, in which they remain inactive. They are close to the surface in autumn prior to ploughing, and in very dry weather may be blown to uninfested fields, but this method of spread is unimportant. During intrafloral life, the larvae of *S. mosellana* in their puparia are very resistant to dryness [**24** 348], and the larvae in their cocoons were found to resist dryness for 15–28 days, whereas free larvae died in 6–8 days. Both free larvae and those in cocoons showed great resistance to water; of 100 mature larvae removed from the ears and placed in water for 44 days, 75 survived. The larvae in cocoons were also very resistant to cold, though an exposure for 6 days to −26°C. [−14·8°F.] appeared to have some effect.

In an unploughed field, most of the larvae were within 4 cm. of the surface. Ploughing distributes them to a greater depth, where they remain inactive as in unploughed land. From August 1932 to March 1933, only about 2·7 per cent of the larvae in an unploughed field were free, whereas in April–May 1933, 33 per cent. were free and migration to the surface began. At the end of May, 87 per cent. were free larvae or pupae. In a ploughed field, migration also occurred in April–May, but owing to their greater initial depth, many larvae were still some distance below the surface at the end of May. Temperature had a considerable influence on resumption of activity; a rise to an average of 3·22°C. [about 37·8° F.], with a minimum of 2·5°C. [36·5°F.] and a maximum of 11·2°C. [52·16°F.], caused several larvae to become active in March. Mass migration to the surface may occur in the second half of May if rain follows a dry spell.

The date of pupation and adult emergence depended mainly on the temperatures in May and early June. The first pupae were found in the uppermost layers of soil on 15th May in 1934 and on 28th May in 1936, when the temperatures from 1st April onwards were lower. In laboratory tests, the larvae moved upwards in moist, moderately compact soil at the rate of about 10 mm. per day, whereas the pupae had a speed not exceeding 3·5 mm., and the adults could not make their way through the soil and died if they emerged below the surface.

The proportion of larvae that hibernated twice varied considerably, but appeared to represent between 20 and 50 per cent. of the original number. There was considerable larval mortality, which doubtless accounted for the great decrease in injury in 1936 and 1937. The mortality appeared to be caused by some infection in the soil.

JOHANSSON (E.). **Studier och försök rörande vetemyggorna** *Contarinia tritici* **Kirby och** *Clinodiplosis mosellana* **Géh. samt deras bekämpande. IV. Undersökning av vetemyggornas parasiter : I. I Svalöf och Weibullsholm åren 1392–1395 anträffade arter.** [Studies and Experiments on the Wheat Gall-midges, *C. tritici* and *Sitodiplosis* (*Clinodiplosis*) *mosellana*, and their Control. IV. Investigations on the Parasites of the Wheat Gall-midges : 1. Species observed in Svalöf and Weibullsholm in 1932–35.]— *Medd. St. Växtskyddsanst.* no. 15, 19 pp., 8 figs., 21 refs. Stockholm, 1936. **VI. Undersökning av vetemyggornas parasiter 2. Vetemyggparasiternas ekologi.** [Investigations on the Parasites of the Wheat Gall-midges: 2. Ecology of the Parasites.]— *Op. cit.* no. 21, 45 pp., 12 figs., 54 refs. 1937. (With Summaries in German.)

The first paper includes a systematic account of the Hymenopterous parasites of the wheat gall-midges, *Contarinia tritici*, Kby., and *Sitodiplosis* (*Clinodiplosis*) *mosellana*, Géh., that were taken in wheat fields in southern Sweden in 1932–35 and bred out in the laboratory. They included the Scelionids, *Leptacis tipulae*, Kby., *Isostasius punctiger*, Nees, and an unidentified species of *Platygaster* from *C. tritici*, and the Miscogasterid, *Macroglenes penetrans*, Kby., which was in turn parasitised by the Scelionid, *Piestopleura thomsoni*, Kieff., from *S. mosellana*. *Platygaster tuberosula*, Kieff., and the Miscogasterid, *Pirene chalybea*, Hal., were also obtained, but the host was not identified. The adults of all these species are described in detail.

The parasites resembled one another in their life-history. They overwinter in the egg stage in the larvae of the host and have one generation a year. Several eggs were sometimes deposited in a single larva, but only one parasite usually emerged from it.

The second paper includes a detailed study of the effect of climatic factors, both in the laboratory and in the field, on the parasites, with special reference to *I. punctiger* and *L. tipulae*, which were the only two of economic importance. Most adults of these species were taken at temperatures of 18–26 and 18–24°C. [64·4–78·8 and 64·4–75·2°F.], respectively. The results of investigations on the effect of atmospheric humidity varied in different localities, but it appeared that *Leptacis* preferred a low, and *Isostasius* a high, relative humidity, combined with medium temperature. At constant temperatures of 23–24, 19–20 and 16–17°C. [73·4–75·2, 66·2–68 and 60·8–62·6°F.], the egg stage of *Isostarius* lasted 25–30, 30–35 and 45–50 days, respectively, and that of *Leptacis* 30–35, 40–45 and 55–60. No development took place below 11°C. [51·8°F.]. Theoretical figures are calculated for other temperatures. Field observations showed that the highest percentage of overwintered eggs hatched when soil humidity was low in autumn and high in spring, conditions that exist mostly in south-eastern Sweden.

The parasites were more numerous in fields of late wheat than in those of earlier varieties, and at the edges of the fields than in the centre.

Ossiannilsson (F.). **Lucerngallmyggan** (*Contarinia medicaginis* **Kieff.**).—*Medd. St. Växtskyddsanst.* no. 20, 43 pp., 26 figs., 13 refs. Stockholm, 1937. (With a Summary in German.)

In view of the possibility of an increase in the cultivation of lucerne for seed in Sweden, investigations were carried out at Svalöf in 1935–37 on the lucerne gall-midge, *Contarinia medicaginis*, Kieff., which infested 100 per cent. of the plants in experiment fields. This Cecidomyiid, all stages of which are described in detail, is widely distributed in the south of Sweden, where, in addition to cultivated lucerne (*Medicago sativa*), it also attacks the wild species, *M. falcata*.

Females oviposit, mostly in the evening, in the unopened flower-buds, which cease to develop after about a fortnight and assume a gall-like appearance. The average number of larvae per gall in investigations was 4·7, but no relation was observed between the size of galls and the numbers or stage of development of the larvae in them. In the laboratory, the egg stage lasted about 2 days, and larval development about 12. Experiments on the conditions of humidity inducing mature larvae to abandon the galls and enter the soil were inconclusive.

After entering the soil, the larvae formed cocoons at a depth of over 3 cm., but left these to form others at a depth not exceeding 3 cm. for pupation. They usually hibernated before doing this, but some pupated and gave rise to adults before the autumn. Some larvae apparently hibernated for two winters.

There are 2–3 overlapping generations a year, the peaks of male emergence occurring a day earlier than those of the females. Emergence of the overwintered generation in all three seasons began in mid-June and continued until early August, with peaks in warm periods. Adults live only a few days, unpaired females somewhat longer, and take no food or water. Of all the adults that emerged in the laboratory, 56·6 per cent. were females.

Parasites of *C. medicaginis* taken in lucerne fields included the Eulophid, *Omphale varipes*, Thoms., which oviposits in the young galls and hibernates in the pupal cocoons, and the Scelionid, *Inostemma opacum*, Thoms., which oviposits in the buds. The former has one, and the latter two, generations a year. Various possible methods of control are discussed, but further work is necessary to ascertain their value.

Horn (W.). **Ein dritter Beitrag über Insekten, welche Bleimäntel von Luftkabeln durchbohren, nebst vergleichenden Bemerkungen über ähnliche Beschädigungen durch Vögel (und Eichhörnchen).** [A third Contribution on Insects that bore into the Lead-sheathing of aerial Cables, with comparative Remarks on similar Injuries by Birds (and Squirrels).]—*Arb. physiol. angew. Ent. Berl.* **4** no. 4 pp. 265–279, 20 figs. Berlin, 15th December 1937.

Notes are given on cases of primary injury to lead-sheathed aerial cables, all apparently due to Bostrychids, recorded in Germany, Greece, Turkey and Montevideo since 1935 [*cf. R.A.E.*, A **23** 121]. In only six instances was the insect concerned definitely identified; *Schistoceros bimaculatus*, Ol., and *Sinoxylon sexdentatum*, Ol., were responsible for one and four, respectively, of the cases in Greece, and *Micrapate brasiliensis*, Lesne, for one case at Montevideo.

Secondary injury by the larvae of beetles that encountered cables when boring their way through timber and accidental injury by Lepidopterous larvae are recorded from Germany. Injuries by birds and squirrels are described, to enable them to be differentiated from those due to insects.

ECKSTEIN (K.). **Parasiten der Nonne,** *Lymantria monacha* **L.** [Parasites of the Nun Moth.]—*Arb. physiol. angew. Ent. Berl.* **4** no. 4 pp. 292–296, 5 refs. Berlin, 15th December 1937.

Parasites obtained from larvae of *Lymantria monacha*, L., at Tharandt, Germany, in 1937 included an Ichneumonid of the genus *Casinaria* (*Trophocampa*), 3 examples of which were reared from a single host in June, and the Eulophid, *Elachertus monachae*, Ruschka & Fulmek, of which 30 larvae left 11 host larvae between 23rd and 26th May and pupated within 24 hours, the largest number from a single host being 8. The females of both these parasites oviposit in the eggs of *L. monacha*, and their larvae develop in the young host larvae. An instance is recorded of a larva of *L. monacha* surviving parasitism by *Meteorus versicolor*, Wesm. Both parasite and host pupated (on 4th and 22nd July, respectively), and a male moth emerged from the host pupa.

SACHTLEBEN (H.) & THIEM (H.). **Die Aussetzung der Blutlauszehrwespe (*Aphelinus mali* Hald.) in Berlin-Dahlem und ihre Verbreitung in der Provinz Brandenburg.** [The Liberation of the Woolly Aphis Parasite, *A. mali*, in Berlin-Dahlem and its Spread in the Province of Brandenburg.]—*Arb. physiol. angew. Ent. Berl.* **4** no. 4 pp. 297–321, 6 figs., 1 map. Berlin, 15th December 1937.

Sachtleben (pp. 297–299) briefly describes the introduction in 1928 of *Aphelinus mali*, Hald., for the control of *Eriosoma lanigerum*, Hsm., on apple in Berlin-Dalhem. A consignment of the parasite was received from Italy in June, adults were released in an orchard at the end of the month, and examples of a new generation were observed in August.

Thiem (pp. 299–321) records the results of a survey of the distribution of *A. mali* in Brandenburg in 1937, carried out in view of the fact that it was widespread and abundant in the orchard districts on the Lower Elbe, where it had been introduced in 1933 [*R.A.E.*, A **23** 717]. It was found to occur in and near Berlin, in other parts of western Brandenburg, and in various localities of the province to the east of the Oder, where it had been liberated in 1924 and 1925. It was abundant in the districts on the Havel, in which conditions are similar to those on the Lower Elbe in that the orchards are extensive and the trees are so close together that the crowns intermingle and shade the ground as in a forest. The author concludes that the value of the parasite depends more on these ecological conditions than on regional climate. Its importance is small in open, airy orchards, but is likely to be considerable in closely planted orchards in which the very denseness of the trees is a hindrance to satisfactory artificial control. During inspection in the autumn, it was found that *A. mali* increased more rapidly than its host at an average temperature of 11°C. [51·8°F.].

ABRAHAM (R.). **Beobachtungen über die Eiablage einiger Capsiden.** [Observations on the Oviposition of some Capsids.]—*Arb. physiol. angew. Ent. Berl.* **4** no. 4 pp. 321–324, 2 figs., 8 refs. Berlin, 15th December 1937.

These observations were made in the orchard districts on the Lower Elbe, the eggs found being those of *Plesiocoris rugicollis*, Fall., *Psallus ambiguus*, Fall., and *Lygus pabulinus*, L., in young apple shoots, *Orthotylus marginalis*, Reut., *Heterotoma meriopterum*, Scop., *Pilophorus clavatus*, L., and *P. perplexus*, Dgl. & Scott, in shoots of currant, *Phylus coryli*, L., and *P. coryli avellanae*, Meyer, in young hazel shoots, and *Calocoris norvegicus*, Gmel., in stems of tansy (*Tanacetum vulgare*). All these Capsids insert their eggs at some depth. Oviposition of *Psallus ambiguus* and *Plagiognathus arbustorum*, F., in currant shoots was observed in the laboratory, the former also ovipositing in the midrib of a currant leaf. The method of oviposition is described; *Plagiognathus* deposited several eggs in one puncture. The deposition of batches of eggs sometimes injures the shoots, and eggs inserted at a depth escape the action of insecticides.

HEIL (K. H.). **Eine Schwammspinnerkalamität am Rhein.** [An Outbreak of the Gipsy Moth on the Rhine.]—*Nachr. Schädl-Bekämpf.* **12** no. 4 pp. 218–225, 7 figs., 7 refs. Leverkusen, November 1937.

A local outbreak of *Lymantria* (*Porthetria*) *dispar*, L., occurred in 1936 near St. Goarshausen on the Rhine. When inspected in mid-July, the trees and shrubs, except *Genista*, were completely defoliated, and most of the larvae had pupated. Rainy, cold weather then occurred and presumably reduced adult emergence. Batches of 515 and 865 larvae placed in cages had mortalities of 50 and 47 per cent. respectively, chiefly due to polyhedral disease. Of 312 pupae from trees, bushes and the ground, only 118 developed into adults, over 60 per cent. being parasitised, diseased or otherwise injured. Of pupae bred from larvae, only 52 per cent. were parasitised, which is explained by their removal from exposure to parasites. Most of the parasites observed were Tachinids, but 6 pupae contained species of *Apanteles*, and 2 examples of *Pimpla examinator*, F., emerged. *Calosoma sycophanta*, L., destroyed many pupae in this outbreak.

MIESTINGER (K.). **Erfolgreiche Abwehr des Apfelblütenstechers.** [A successful Defence against the Apple Blossom Weevil.]—*Neuheiten PflSch.* **30** pt. 6 pp. 247–249. Vienna, December 1937.

In 1937, a tar-distillate emulsion of the type classed as Baumspritzmittel [*cf. R.A.E.*, A **24** 797] was tested against *Anthonomus pomorum*, L., on apple in two districts of Austria. The emulsion was applied when the flower buds were about to open at concentrations of 5 and 8 per cent. in water, 1 per cent. Bordeaux mixture or normal lime-sulphur mixture diluted to one-third strength, and one very thorough application gave excellent results. In one district the infestation averaged 1 per cent. on 19 out of 23 treated trees and was between 1 and 3·75 per cent. on the other four, whereas it varied from 15 to 76 per cent. on unsprayed trees. No noticeable difference in action was observed between the 5 and 8 per cent. emulsions, or between those

made with water or lime-sulphur. The Bordeaux mixture seemed to decrease the efficiency of the spray, but not to an extent important in practice. A spray of this type is known to be an effective insecticide against *A. pomorum*, but it evidently also has a very valuable repellent effect, preventing infestation by weevils migrating from unsprayed trees.

SINDERSBERGER (M.) & MARCUS (A.). **Das Aufreten der Fohreneule in Mittelfranken 1928–1931.** [The Occurrence of the Pine Noctuid in Central Franconia in 1928–31.]—*Mitt. StVerw. Bayerns* pt. 22, 115 pp., 1 fig., 6 pls. Munich, 1937. (Abstr. in *Neuheiten PflSch.* **30** pt. 6 p. 260. Vienna, December 1937.)

Very successful results were obtained in the control of *Panolis flammea*, Schiff., on pines in Central Franconia (Bavaria) by dusting with Forestit [*R.A.E.*, A **20** 314]. The dust was applied in fine weather, about 11,300 and 2,700 acres being treated by aeroplane and power units, respectively. No felling was necessary, and the danger from secondary pests was unimportant. A bacterial disease attacked the mature larvae, but failed to prevent defoliation. Pines near nests of the red ant [*Formica rufa*, L.] were almost free from infestation [*cf.* **23** 65, etc.].

[PANASYUK (M. P.).] **Панасюк (М. П.). Ed. Chief Conclusions of the Scientific Research Work of the All-Union Scientific Research Institute of Sugar Industry for the Year 1936.** [*In Russian.*]—Super-Roy. 8vo, 285 pp., 6 graphs, 39 figs. Kiev, 1937.

This is a collection of summaries of unpublished reports on investigations during 1936, some of which deal with pests of sugar-beet in the Russian Union and their control.

In The Application of the Egg Parasite, *Trichogramma evanescens* Westw., for the Control of Pests of Sugar-beet (pp. 117–119), P. F. Sobol' states that breeding the parasite at the optimum temperature of 27–29°C. [82·4–84·2°F.] does not affect its ability to attack eggs in the field. Host eggs are attacked at temperatures ranging from 8 to 40°C. [46·4–104°F.]; in the laboratory, those of 103 species of insects were parasitised. The fertility of a laboratory strain of the parasite decreases gradually, but can be restored by introduction of fresh parasites from the field. From experiments with a number of Lepidoptera, including *Sitotroga cerealella*, Ol., it was concluded that *Barathra brassicae*, L., is the most satisfactory species from which to obtain host eggs for mass-rearing of the parasite. The larvae are best reared on leaves of sugar-beet until the fourth or fifth instar and then transferred to cabbage. The pupae can be kept on ice for a year, whereas those of *S. cerealella* kept at 4–5°C. [39·2–41°F.] died within a month. The average numbers of eggs deposited by females having pupal weights of 250–300 and 550–600 mg. were 287 and 2,030 respectively. Supplementary feeding on honey resulted in maximum egg-production. Optimum conditions for rearing the larvae were 18–20°C. [64·4–68°F.] and a relative humidity of 50–60 per cent. Pupae from larvae reared at temperatures below 20°C. entered a diapause that lasted a year or longer. When the larvae were reared at 25°C. [77°F.], 30–60 per cent. of the pupae diapaused, whereas there was no diapause after rearing at 30°C. [86°F.].

In the Province of Kiev, *T. evanescens* may produce up to 8 generations a year, larval diapause occurring in spring and autumn when the temperature drops to 11°C. [51·8°F.]. A reduction in the numbers of the larvae of *Euxoa segetum*, Schiff., on beet by 70–80 per cent. was obtained by releasing *T. evanescens* at the rate of 32,000 individuals per acre.

B. I. Bel'skiĭ, in Rationalisation of the Control of the Moths of the Winter Crops Noctuid (pp. 121–122), states that field experiments in 1935 in 35 localities on the use of baits of poisoned molasses against adults of *Euxoa segetum*, Schiff., confirmed the results obtained previously [**24** 643]. Of aromatic substances tested for addition to the bait [*loc. cit.*], amyl acetate, butyl acetate and ethyl acetate were effective in that order. Covering the containers during the day improved fermentation, preserved the bait and the ethers given off by it, and increased the catch of moths by 28–60 per cent.

I. M. Yarmolenko, in The Method of Cutting directional Ditches for the Control of the Beet Weevil (pp. 122–123), records further field experiments [*cf.* **25** 278] demonstrating the value of farm-tractors in making ditches to trap the beet weevil [*Cleonus punctiventris*, Germ.]. Details are given of the types and dimensions of the treads used.

I. I. Korab, E. N. Savchenko and I. M. Yarmolenko, in The Application of certain poisonous Substances for the Control of the Larvae of the Beet Weevil and other Soil Pests (pp. 125–126), describe further experiments [*cf.* **25** 572] carried out in the Province of Kiev between 25th June and 19th August 1936 on the fumigation of the soil with chloropicrin against *C. punctiventris* and other pests. Owing to severe drought, the soil was very dry and loose, so that the chloropicrin diffused rapidly and was very effective. The greatest numbers of weevils occurred at a depth of 8–10 ins. Quantities of the fumigant that gave complete control injured the beet and should therefore be applied only after the harvest. Almost complete control of all stages of the weevil and a high mortality of larvae of Lamellicorns, wireworms and cutworms was obtained with chloropicrin and carbon bisulphide at rates of 675–900 and 1,080 lb., respectively, per acre, but the cost was rather high. At these rates, carbon bisulphide was less injurious to the plants than chloropicrin. The addition to chloropicrin of paradichlorobenzene, naphthalene, or raw anthracene in proportions of 1 : 4, 1 : 8, or 1 : 20, respectively, rendered it effective at rates of 360–450 lb. per acre.

In Determination of effective Dosages of Anabadusts for the Control of Beet Aphids, by E. N. Savchenko (pp. 126–127), the results are given of laboratory tests against immature beet Aphids of dusts of anabasine sulphate mixed in concentrations of 1–6 per cent. with various carriers. Their effectiveness was compared with that of "Aning" [**24** 352], which gave 98·5 per cent. mortality. All the dusts were applied at a rate equivalent to 36 lb. per acre. A 4 per cent. dust prepared with freshly slaked lime was the most effective, giving 98·3 per cent. mortality. Dusts mixed with talc or kieselguhr were the least effective, and although a 4 per cent. dust prepared with magnesium carbonate gave 95·7 per cent. mortality, it did not adhere well and formed lumps.

S. P. Ivanov and E. N. Zhitkevich, in Effect of Temperature and Humidity on the Development of the Common Beet Weevil (pp. 127–129), give the results of preliminary laboratory observations on the

fertility of *Cleonus punctiventris*. Adults kept at 17–19°C. [62·6–66·2°F.] and high humidity laid few eggs, of which 50–55 per cent. hatched. Females probably require repeated pairing, as oviposition soon ceased unless males were present. At temperatures of 29 and 29·4°C. [84·2 and 84·9°F.] and mean relative humidities of 82 and 64 per cent., respectively, the average numbers of eggs laid by a female were 90·2 and 125, and the duration of life 44·4 and 72·5 days. At 26°C. [78·8°F.] and humidities of 75–76, 30 and 6–7 per cent., the percentages of the eggs that hatched were 73–100, 22–45 and 23–30, respectively, the corresponding percentages at 30°C. [86°F.] being 60, 20 and 10. The influence of temperature on development was determined for eggs in the laboratory and for larvae and pupae on the basis of field observations over a number of years. The threshold of development was 11–14°C. [42·8–57·2°F.] for eggs, 6–9·6°C. [42·8–49·28°F.] for larvae and 3–6°C. [37·4–42·8°F.] for prepupae and pupae, and the sums of effective temperatures were, respectively, 115–130, 560–730 and 200–275 day-degrees C. [207–234, 1008–1314 and 360–495 F.]. The threshold of development for the older larvae was considerably lower than that for the eggs and young larvae, though the temperature sum steadily increased, which is explained by the fact that the eggs and young larvae develop in the summer when it is hot, whereas the older larvae and pupae do so in the autumn in cool weather. Mortality among larvae and pupae is heavy if there are sharp fluctuations of temperature and a considerable increase in humidity.

In New Data on the Biology of the Grey Beet Weevil (*Tanymecus palliatus* F.) (pp. 129–130), S. P. Ivanov states that females in the laboratory could lay over 50 eggs in 24 hours, but oviposition was very irregular and was sometimes interrupted for several days. At 20°C. [68°F.], the larvae hatched in 13–14 days. Field observations showed that the development of a generation required two years ; the overwintered larvae pupate in June-July. The larvae feed on the thin rootlets and filaments of different plants, chiefly weeds.

[Savchenko (E. N.) & Dzevaltovskaya (N. G.).] **Савченко (Е. Н.) и Дзевалтовская (Н. Г.). Results on comparative Tests on new Activators for Anabasine Sulphate in combating the Beet Aphis.** [*In Russian.*]—*Nauch. Zap. sakharn. Prom.* **14** no. 3 pp. 34–42, 14 refs. Kiev, 1937.

In the Russian Union, soft soap is usually added to sprays of anabasine sulphate to increase their effectiveness against Aphids on beet ; it is, however, expensive and can only be used with soft water [*cf. R.A.E.*, A **24** 20]. Other possible activators were therefore tested in the laboratory in 1935–36 ; they were applied in sprays containing 0·03 per cent. anabasine sulphate to immature examples of *Myzus* (*Myzides*) *persicae*, Sulz., on leaves of beet. At this concentration, anabasine sulphate alone gave 37 per cent. mortality in 24 hours. Several of the activators proved to be satisfactory substitutes for soft soap ; the best were three samples of sodium salts of naphthalene-sulphonic acids, since they increased the percentage mortality of the Aphids to 80 or more when used at a concentration of only 0·5 per cent., dissolved easily and could be used with hard water as well as soft.

The physico-chemical properties of the solutions were studied and are discussed. Practically all the organic activators (notably the sodium naphthalene-sulphonates) decreased the surface tension of the

solution, which showed maximum effectiveness when the surface tension was rather less than half that of distilled water. An activator that gave an acid solution did not reduce its effect to any marked extent provided that the surface tension was sufficiently reduced [*cf.* **24** 760]. On the whole, viscous solutions were less effective than others as they moved more slowly along the tracheae of the Aphids.

A comparison of the mechanism of activation of anabasine sulphate with that of nicotine sulphate showed them to be identical. Carbonates of alkaline metals, which are known to increase the effectiveness of nicotine sulphate, could therefore be used to activate anabasine sulphate; they do not scorch beet and so could be applied against beet Aphids without preliminary tests.

[Yakhontov (V. V.).] **Яхонтов (В. В.). Practical Results of an Experiment. A Biological Method of controlling Pests of Lucerne and Cotton.** [*In Russian.*]—*Vuisshaya Shkola* no. 1 pp. 77–81. Moscow, 1937.

Hypera variabilis, Hbst., is a serious pest of the first crop of lucerne in Central Asia, sometimes reducing the yield by over 65 per cent. In 1935 and 1936, special investigations were carried out in northern Uzbekistan, southern Kazakstan and south-western Kirghizia on the possibility of using two Coccinellids, *Brumus octosignatus*, Gebl., and *Semiadalia undecimnotata*, Schneid., for the control of this weevil and of Aphids on cotton. The adults of the second generation of these Coccinellids, both of which are abundant in Central Asia, fly in large numbers to the mountains in late July and early August, almost as soon as they emerge. This migration is due to lack of food in the hot valleys as a result of the drying up of the vegetation; owing to the comparatively low temperature in the mountains, the beetles can enter hibernation without feeding, especially as they possess an abundant fat-body. They hibernate each year in the same places, to which they are apparently attracted by the odour of dead individuals of their own species. *B. octosignatus* hibernates at the base of shrubs in places exposed to wind at altitudes of 1000–2000 ft., whereas *S. undecimnotata* does so in cracks in rocks at above 5000 ft. It was found possible to collect large numbers of the Coccinellids by arranging suitable shelters (open wooden boxes for *Bromus* and heaps of stones for *Semiadalia*) in the mountains. A few handfuls of dead adults of their own species served to attract them into the shelters. Under natural conditions, the return migration to the mountain slopes and valleys continues over a considerable period and many of the beetles arrive too late to control *Hypera*, but before the appearance of the Aphids on cotton. It was found, however, that the adults collected in autumn and winter could be kept in good condition at 4–8°C. [39·2–46·4°F.] and could then be liberated as required. Both in the insectary and in the field, the Coccinellids readily fed on larvae of *Hypera*, particularly the younger ones, and on Aphids. The average numbers of eggs laid by females of the overwintered and first generations were 425 and 365, respectively, for *Bromus*, and 139 and 73 for *Semiadalia*.

In field experiments in which the Coccinellids were liberated in lucerne fields at the rate of 1 adult to 20–50 larvae of *Hypera*, infestation by the latter was considerably reduced and the yield of the first crop was increased by 4–12 cwt. of fresh lucerne per acre. In the case of

Aphids on cotton, all were destroyed in 2 days. It was found that the beetles do not remain long in the cotton fields during the hot weather in the summer.

The only natural enemy of any importance attacking these Coccinellids is a fungus, *Tarichium jachontovi*, which infests them when they are hibernating.

VOLKONSKY (—). *Schistocerca gregaria* **Forsk. ph.** *solitaria* **dans le sud algérien.**—*C. R. Soc. Biol.* **126** no. 34 pp. 1125–1128, 6 refs. Paris, 1937.

In November 1937, solitary adults of *Schistocerca gregaria*, Forsk., were found in the Territoires du Sud, Algeria in a number of oases in Lower Touat, where they were confined to palm-groves, and in the depressions of the Great Western Erg, with scattered bushy vegetation. All the specimens collected were sexually immature, belonged to typical phase *solitaria*, and showed a very narrow range of biometrical variations.

HARGREAVES (E.). **Entomological Work.**—*Rep. Dep. Agric. S. Leone 1936* pp. 39–43. Freetown, 1937.

Fruit-piercing moths observed in Sierra Leone [*cf. R.A.E.*, A **25** 254] in 1936 included *Sphingomorpha pudens*, Holl., and *Tolna sypnoides*, Btlr.; additional food-plant records are given for some of the species.

The Lycaenid, *Deudorix bimaculata*, Hew., attacked the robusta and excelsa varieties of coffee as well as liberica, but preferred the larger fruits. It prefers coffee to *Heinsia pulchella*, and the intensity of infestation of the former appears to depend on the amount and proximity of the latter. Oviposition takes place in September. In rare cases two eggs are laid on one fruit, but only one larva survives. All moults occur inside the fruit, and a single larva destroys at least 10 berries. The larval stage lasted about 3 weeks, and the pupal stage 10–11 days. Some Hymenopterous parasites were observed. Against the fruit-fly, *Ceratitis* (*Trirhithrum*) *coffeae*, Bezzi, which became more abundant during the year, collection and burning of fallen coffee berries is advocated.

Tests of treatments of *Cola* nuts against *Balanogastris kolae*, Desbr., showed that fumigation for three hours with carbon bisulphide at a concentration of 3 per cent. killed all stages except some pupae and eggs, and the nuts were unaffected; boiling water and carbon tetrachloride (which was ineffective) both injured the nuts. The adult weevils all died within 7 days after crawling over a surface dusted with sodium fluosilicate. The larval and pupal stages of this weevil last 9 or more, and 4–5 days, respectively, and adults require about 3 days to harden and assume the normal colour. Some adults lived for over 100 days.

Work on virus diseases of ground-nuts (*Arachis*) was continued, and the microphyllous type was successfully transmitted by means of *Aphis laburni*, Kalt. [*cf.* **25** 103]. A disease that is probably a fifth virus disease of ground-nuts has been observed, but transmission trials have not yet given positive results. *A. laburni* became abundant towards the end of July, and virus disease had appeared in all the plots in mid-July irrespective of the time of planting. For plots sown on 14th April, 20th and 27th May, and 3rd and 10th June, the relative

yields were 142, 158, 89, 67 and 45, respectively; the percentage infections were 0·9, 3·2, 7·8, 11·1 and 16·3 on 30th July, and they increased later. Spacing trials indicated that 12-inch spacing gave a higher yield per area than nearer spacings. The incidence of disease was much less in a plot under cassava shade than in one in the open, but sufficient shade to decrease it to any marked extent may result in reduced yield. Further attempts to obtain transmission of mosaic disease of cassava by Aleurodids [*cf.* **25** 103] were unsuccessful.

Early in July, rice in some areas was considerably damaged by a Pentatomid, probably *Nezara chloris*, Wstw. Its native food-plant is *Rottboellia exaltata*, and this grass did not flower until early October, when a few of all stages of the insect were found on it. Females laid 300 or more eggs in batches of not more than 40 on the leaves or ears. The nymphs hatched in 3–7 days and passed through five instars. They generally fed on grass blades in the first instar, but later preferred the ear; only 3 out of 112 succeeded in reaching the third instar in the absence of ears, and these died soon afterwards. From July to September the nymphal stage was completed in about 20 days, but from November to December it lasted 48 days. High humidity is evidently necessary for favourable development. The pre-oviposition periods of adults emerging in mid-August, early September and mid-November were about 20, 36, and 32 days, respectively. The average adult longevity was about 55 days, and one adult punctured 70 grains in 8 days. Hymenopterous egg-parasites were observed; hand-collection was adopted for control, with good results where it was carried out early. In late May, rice and other grasses were attacked by army worms, probably *Laphygma exempta*, Wlk., in great numbers. The larval and pupal stages occupied 10–14 and 6 days, respectively. The main generation did not oviposit, the moths disappearing with the advent of heavy rains. In experiments on storage of sun-dried seed rice from January to March, there was no decrease in germination when the rice was kept in a sealed container, and little if any when it was fumigated with carbon bisulphide at the rate of 6 lb. per 1,000 cu. ft. or stored in containers with paradichlorobenzene at rates of 0·357 to 1·79 gm. per 1,000 cc.

Other pests injurious during the year were *Apate monacha*, F., on avocado, cassava, *Cola*, guava and mango; *Brachyurothrips hargreavesi*, Bagn., on *Hydrangea*, pomegranate, egg-plant and tomato; and *Calotermes lamanianus*, Sjöst., in timber. Damage by *Locusta migratoria*, L., was negligible.

King (C. B. R.). **Termites.**—*Tea Quart.* **10** pt. 3 pp. 160–166, 2 pls., 4 refs. Talawakelle, October 1937.

This paper comprises a brief survey of the bionomics of termites in general and is intended to serve as an introduction to notes about to be published on *Calotermes* (*Neotermes*) *militaris*, Desn., infesting tea in Ceylon.

Anantanarayanan (K. P.) & Ramakrishna Ayyar (T. V.). **Bionomics of the swarming Caterpillar of Paddy in South India.**—*Agric. Live-Stock India* **7** pt. 6 pp. 725–734, 1 pl., 10 refs. Delhi, November 1937.

Descriptions are given of the larval instars of *Spodoptera mauritia*, Boisd., together with an account of its bionomics as a pest of rice in

South India [*R.A.E.*, A **23** 732; **25** 748]. The larvae attack rice only when it is young, but also feed on various grasses, and have been found in other parts of India on maize, barley and wheat. In a cage in which both were grown, they preferred *Panicum setigerum* to young rice. The parasites include the Ichneumonid, *Charops dominans*, Wlk., the Braconids, *Apanteles ruficrus*, Hal., and *Chelonus* sp., the Eulophid, *Euplectrus euplexiae*, Roh., and the Tachinids, *Cuphocera varia*, F., *Sturmia inconspicua*, Mg. (*bimaculata*, Htg.), and *Tachina fallax*, Mg.

Deshpande (V. G.). **Cabbage Aphis**—*Siphocoryne indobrassicae*—**and its Control with Home-made Nicotine Spray.**—*Agric. Live-Stock India* **7** pt. 6 pp. 756–762, 4 refs. Delhi, November 1937.

An account is given of observations on the bionomics of *Rhopalosiphum pseudobrassicae*, Davis (*Siphocoryne indobrassicae*, Das) carried out for several years at Poona, and of experiments on the control of this Aphid and *Myzus persicae*, Sulz, both of which cause serious damage to cruciferous crops in India. Unlike *M. persicae*, *R. pseudobrassicae* is more or less restricted to crucifers; it is the commonest Aphid on cabbage during the winter and spring. The alate viviparous females appear in the seed beds in October, generally when the minimum temperature falls to 60°F. or below, and reproduce. When the infested seedlings are transplanted, multiplication proceeds rapidly, and both alate and apterous females are produced. The population reaches its maximum in February, but the Aphids practically disappear during March and are not seen again until the following October. Under laboratory conditions, the nymphal stage comprised 4–5 instars and lasted 6–7 days. The reproductive period varied from 26 to 41 days, and the number of young produced by a single female from 38 to 102.

When present in large numbers, the Aphids cause deformation of the leaves, which become wrinkled and curled, while their market value is also reduced by the abundant secretion of honey-dew. In experiments on control, 100 per cent. mortality was caused by spraying with Derrisol (1 : 800) or nicotine sulphate (1 : 800), or dusting with Cyanogas calcium cyanide. The dust, however, scorched the leaves, and Derrisol is no longer obtainable. A plot of cabbages sprayed only twice with nicotine sulphate yielded 685 heads weighing 2,388 lb., whereas a control plot yielded 454 weighing 1,024 lb. A spray that gave 95–97 per cent. mortality and cost only one-seventh as much as the nicotine sulphate spray was prepared by soaking 1 lb. tobacco waste with a nicotine content of 2·3 per cent. in 2 gals. cold water for 24 hours and then straining the extract and diluting it to 4 gals. for use. Soaking in hot water or adding soap did not increase its efficiency. Tobacco waste containing less nicotine was equally effective if the amount used was increased to give the same nicotine concentration (0·05–0·06 per cent.) in the spray.

Pruthi (H. S.). **Report of the Imperial Entomologist.**—*Sci. Rep. agric. Res. Inst. New Delhi 1936–37* pp. 159–174, 3 pls. Delhi, 1937.

Most of the work in the year ending 30th June 1937 was carried out at Pusa [*cf. R.A.E.*, A **25** 529]. Sugar-cane was attacked by *Pyrilla* and the usual moth borers [*loc. cit.*], including, occasionally, *Scirpophaga monostigma*, Zell. *Coniopteryx pusana*, Withycombe, appeared at the end of July and deposited its eggs singly near the egg-masses of

Pyrilla, on the eggs of which the larvae fed. The egg, larval and pupal stages of this Neuropteron lasted about 3–4, 20–25, and 9 days, respectively.

Further experiments were carried out on the transmission of virus diseases of tobacco and sunn-hemp (*Crotalaria juncea*), by *Bemisia gossypiperda*, Misra & Lamba [**26** 88]. The "A" type of leaf-curl was transmitted by the Aleurodids from diseased sunn-hemp to healthy tobacco seedlings as in the previous year. In 4 series of 32 experiments carried out between mid-September and early November, the insects were kept on tobacco with A, B, C and X types of leaf-curl for 12–48 hours and then transferred to healthy sunn-hemp. Two seedlings reacted to some extent, but none developed typical leaf-curl. As however, the incidence of the disease in sunn-hemp is most serious in the field at Pusa in August, the plants might have passed the stage when they were most susceptible. In 24 experiments carried out in October, 4–12 Aleurodids were kept on diseased sunn-hemp for 24 hours, and 4 of the healthy sunn-hemp seedlings to which they were transferred developed a type of leaf-curl. In 269 experiments carried out between 14th September 1936 and 9th February 1937, the A, B, C, D and X types, both individually and in various combinations, were transmitted from diseased to healthy tobacco; the Aleurodids transmitted the disease most readily from the end of September to mid-November, and tobacco seedlings about 7 weeks old were most susceptible. *Ageratum conyzoides*, one of the common weeds at Pusa, was severely infested with a leaf-curl disease similar to that of tobacco. In December 1936, whiteflies were kept on these plants for 25 hours and then transferred to healthy tobacco seedlings 9 weeks old; 2 out of 6 developed D type of leaf-curl. *B. gossypiperda* was found breeding on *Gossypium herbaceum*, egg-plant (*Solanum melongena*) and *Anisomeles ovata* at Pusa as well as on tobacco and sunn-hemp.

Dasyneura lini, Barnes, infesting the flower-buds of flax [**26** 181], was parasitised by a Chalcid. The parasite deposits its eggs singly in the unopened buds of flax containing nearly full-grown midge larvae, and, rarely, directly on the larvae. They were never found in uninfested buds or in buds containing young host larvae. The newly hatched parasite, which was able to live for about 24 hours without food, attached itself to the body of the host and fed on the body fluid. During its larval period, it destroyed 3–4 host larvae. Pupation took place within the flower-bud. At a constant temperature of 18°C. [64·4°F.] the egg, larval and pupal stages lasted 2–3, 12–15 and 11–13 days, respectively. *Agromyza obtusa*, Mall., which occurs throughout India, infested *Cajanus cajan* (*indicus*) in the early winter and spring. The oviposition period appeared to last from 11th October till towards the end of November. During December and January, only full-grown larvae and pupae were found. The adults emerged in the first warm days of February and began to oviposit; breeding was at its maximum in March and April. How the fly passes the summer is not known.

Trypetids found in May in the fruit frowing areas in the North-West Frontier Province comprised *Dacus* (*Chaetodacus*) *ferrugineus*, F., *D.* (*C.*) *zonatus*, Saund., *D.* (*C.*) *cucurbitae*, Coq., *Carpomyia vesuviana*, Costa, *Myiopardalis pardalina*, Bigot, and *Dacus oleae*, Gmel. In one locality, the percentage infestation of loquat and apricot by *D. ferrugineus* was 50–60. At New Delhi, fruits of *Calotropis* sp. were infested by *Dacus longistylus*, Wied.

It was found that *Earias fabia*, Stoll, and *E. insulana*, Boisd., in *Hibiscus esculentus* were both parasitised by *Microbracon lefroyi*, D. & G., *Actia aegyptia*, Vill., and *Elasmus* sp., the maximum parasitism by *M. lefroyi* being about 10 per cent.

Lists are given of insects found infesting crops of economic importance in Delhi, and of their parasites.

ISAAC (P. V.). **Report of Second Entomologist (Dipterist) in Charge, Scheme for Research on Insect Pests of Sugarcane.**—*Sci. Rep. agric. Res. Inst. New Delhi 1936–37* pp. 175–177. Delhi, 1937.

Records are given of the pests of sugar-cane and their parasites found during a tour in various parts of India. The identified parasites obtained were: *Melcha ornatipennis* [*sic*], Cam., and *Rhaconotus scirpophagae*, Wlksn., from larvae, and *Elasmus zehntneri*, Ferrière, from pupae, of *Scirpophaga* sp.; *Glyptomorpha* (*Stenobracon*) *deesae*, Cam., from larvae of *Emmalocera depressella*, Swinh., *Diatraea* sp., and *Chilo zonellus*, Swinh.; and *Chlorodryinus pallidus*, Perkins, from nymphs, and *Tetrastichus pyrillae*, Crwf., and *Ooencyrtus pyrillae*, Crwf., from eggs, of *Pyrilla* sp. *Icerya pilosa*, Green, was recorded for the first time on sugar-cane in India, and the Coccinellid, *Rodolia* (*Novius*) *guerini*, Crotch, was predacious on it.

NAKAYAMA (S.). **Notes on the Biology of *Cacoecia longicellana* Walsingham.** [*In Japanese.*]—*Ann. agric. Exp. Sta. Chosen* **9** no. 3 pp. 417–423, 1 pl. Suigen, November 1937. (With a Summary in English.)

The leaf-rollers, *Tortrix* (*Cacoecia*) *longicellana*, Wlsm., and *T.* (*C.*) *xylosteana*, L. [*cf. R.A.E.*, A **25** 230] cause serious damage to leaves and fruit of apple in the northern and western apple-growing sections of Korea. *T. longicellana* has three generations in the year, the adults of which appear in June, July and August, respectively. The pre-oviposition period lasts 2–3 days, and up to 212–256 eggs are deposited on the leaves in several masses. The egg, summer larval and pupal stages last 5–8, 16–21 and 7–10 days; the third-generation larvae hibernate among withered leaves attached to or fallen from the trees, The larvae of the first generation feed chiefly on the leaves; those of the other two very often shelter where the leaves and fruits are in contact and feed on both. Pupation occurs in a cocoon spun between leaves.

A thorough application of a lead arsenate spray in mid-June is recommended for control.

CHAN (Mong Shi). **The Problem of the Sugar Business and Sugarcane Insect Pests in Kwangtung.** [*In Chinese.*]—*Problem of Insects* no. 1 pp. 3–8. Canton, 1936. (Abstr. in *Lingnan Sci. J.* **16** no. 4 p. 643. Canton, December 1937.)

The chief pests of sugar-cane in Kwangtung are the moth-borers, *Sesamia inferens*, Wlk., *Eucosma* (*Olethreutes*) *schistaceana*, Sn., *Scirpophaga* spp., including *S. nivella*, F., and species of *Diatraea* and *Chilo*, the Coccid, *Pulvinaria iceryi*, Guér. (*gasteralpha*, Icery), the Aphid, *Oregma lanigera*, Zehnt. and termites. The moth-borers probably have five generations a year. In June, 1,180 larvae and 153 pupae were secured from 9,279 stalks by hand collection.

Chin (Meng-hsiao). **The Life-history and Control of** *Lebeda nobilis*, **Wlk.** [*In Chinese.*]—*Science* **21** no. 7 pp. 529–538, 1 pl. *sine loco*, 1937. (Abstr. in *Lingnan Sci. J.* **16** no. 4 p. 647. Canton, December 1937.)

The larvae of *Lebeda nobilis*, Wlk., which feed on various trees, cause serious damage to *Myrica rubra* in the east and south of China. Eggs are deposited on the small branches and hibernation occurs in the egg stage. The larvae pass through eight instars and pupate in folded leaves. The egg and larval stages average 181 and 139 days, respectively, and the pupal stage lasts 24–29 days. The adults, which live for about a week, are inactive during the day, and may be trapped at lights. Lead arsenate sprays can be used against the larvae.

Chu (Joo-tso) & Sung (Tsu-lien). **Notes on the Life-history of** *Holochlora nawae* **Matsumura et Shiraki.** [*In Chinese.*]—*Ent. & Phytopath.* **5** no. 24–25 pp. 483–491. Hangchow, 1937. (Abstr. in *Lingnan Sci. J.* **16** no. 4 p. 649. Canton, December 1937.)

Notes are given on the bionomics of the Tettigoniid, *Holochlora nawae*, Mats. & Shir., which attacks mulberry, peach, tea, maize and vegetables in Chekiang and Kiangsu. The eggs are laid in late August and early September and hatch in early May. The six nymphal instars last 16–18, 8–11, 11–15, 12–18, 10–16 and 15–25 days, respectively. The adults appear in August and live for about 37 days. From 32 to 51 per cent. of the eggs are parasitised by an Eupelmid of the genus *Anastatus*.

Li (Shou-sing). **Preliminary Observations on** *Parnara mathias* **Fabr.** [*In Chinese.*].—*Ent. & Phytopath.* **5** no. 21 pp. 424–433, 2 pl. Hangchow, 1937. (Abstr. in *Lingnan Sci. J.* **16** no. 4 p. 658. Canton, December 1937.)

Parnara mathias, F., which sometimes attacks rice in China, has three generations during the year, the adults of which appear in July, August and September, respectively. The egg, larval and pupal stages last 4–5, 21–28, and 10–15 days.

Liw (Tiou Fah). [*Parnara guttata*, **Bremer on rice in Kwangsi.**] [*In Chinese.*]—*Problem of Insects* no. 2 pp. 5–8, 3 figs. Canton, 1936. (Abstr. in *Lingnan Sci. J.* **16** no. 4 p. 659. Canton, December 1937.)

Parnara guttata, Bremer [*cf. R.A.E.*, A **25** 589], is the most injurious pest of rice in Kwangsi Province, infestation being particularly severe in August and September. The life-cycle is probably completed in 33–37 days, and there are 5 or 6 generations in the year. Three types of comb-like harrows for removing the larvae from the rice leaves are described, and various cultural practices are recommended for control.

Wang (Fei-peng). **Biology of the Citrus Pest,** *Clania minuscula* **Butl. (Lep. Psychidae).** [*In Chinese.*]—*Ent. & Phytopath.* **5** no. 9 pp. 158–162, 7 figs. Hangchow, 1937. (Abstr. in *Lingnan Sci. J.* **16** no. 4 p. 670. Canton, December 1937.)

Clania minuscula, Btlr., is a serious pest of *Citrus* in Chekiang and also causes considerable injury to other fruit trees. It has one generation a year. In early July, females lay 800–3,000 eggs, which hatch in

about 7 days. The larvae pass through six instars and generally hibernate in the fourth. The larval period and the pupal periods for males and females average 205·17, 21·3 and 18·3 days. The average longevity of males and females is 1·3 and 16·5 days, and they are most abundant in mid-June and early July, respectively. The males can be caught by light-traps. Parasites include the Chalcids, *Brachymeria fiskei*, Crwf., and *B.* (*Chalcis*) *mikado*, Cam.; and the Ichneumonids, *Pimpla* (*Epiurus*) *nankingensis*, Uchida, *P.* (*Exeristes*) *albicincta*, Morley, *Xanthopimpla* sp. and *Theronia atalantae*, Poda.

YANG (Hung-ju). **Notes on the Biology of** *Eusarcoris guttiger* **Thunb. (Hemip.) Kashing.** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* **5** (1935) pp. 159–163, 1 pl. Hangchow, October 1936. (Abstr. in *Lingnan Sci. J.* **16** no. 4 p. 675. Canton, December 1937.)

The Pentatomid, *Eusarcocoris* (*Eusarcoris*) *guttiger*, Thnb., which feeds on various graminaceous plants and is widely distributed in south and east Asia, causes considerable injury to rice in Chekiang. It feeds on the immature grains and sometimes on the leaves and stems, retarding the growth of the plant and leading to the formation of seedless spikes. Hibernation occurs in the adult stage. In the laboratory, females laid 20–100 eggs in batches of about 10 or more on the ears or tips of leaves of rice. The nymphs had 3 instars, each lasting 3–4 days, in hot weather and 4 instars, each lasting about 20 days, in cold weather. The adults are not attracted to lights and always hide in the darkest parts of the food-plants. They live for 1–2 weeks in summer.

WU (Chen-chung). **A preliminary Report of Studies on Control Measures for Chinese Cotton Aphids.**—*Peking nat. Hist. Bull.* **12** pt. 2 pp. 95–112, 1 map, 18 refs. Peiping, December 1937.

Brief notes are given on the morphology of the eggs and the adults of the various forms of *Aphis gossypii*, Glov., and on its life-history on cotton near Nanking [*cf. R.A.E.*, A **24** 324]. In a greenhouse, 29 generations were produced in a year, and parthenogenetic reproduction continued through the winter. In the field, the winter eggs are deposited in October or November on the terminal portions of cotton and various other plants; cotton seedlings often become infested in late spring by Aphids migrating from *Capsella bursa-pastoris*. Observations in Hupeh in 1936 showed that there a very important source of infestation of cotton fields from May to August is the pagoda tree (*Sophora japonica*), which occurs in all villages. Of 32 heavily infested areas investigated, 26 were near villages. Irrigation, which is practised in the dry regions of north China, favours the Aphids, whereas heavy rainfall, such as occurs in the south, destroys them. They are most susceptible to control measures in March and April, when development is retarded, and may be checked then on sparsely vegetated land by the destruction of all weeds.

Experiments were made with a number of insecticides, chiefly some prepared from local products cheap enough for use by farmers. The most effective and the cheapest was cotton-seed oil emulsion. A spray of cotton-seed oil and soda in the proportion of 3 : 1 [*cf.* **24** 325], diluted in 40 parts water gave 98·5 per cent. control; this percentage was reduced to 95·2 when the proportion was 0·3 : 1, and to 86·6

when the emulsion was diluted in 120 parts water. The spray finally recommended contains about 10 oz. soap, 16 oz. sodium carbonate or sodium hydroxide or both, and 16 fl. oz. cotton-seed oil in 31 gals. water. The soda and soap are each dissolved in a little of the water and added to the rest in that order, and the oil is then stirred in.

An even cheaper spray was subsequently prepared from a material called soap-stock, which is a compound of soda and oleic acid precipitated when cotton-seed oil is refined with sodium hydroxide. The spray is prepared by dissolving soap-stock in hot water and further diluting with cold water. At dilutions varying from 60 to 180 parts water by volume, the percentage mortality varied from 97·52 to 84·35, being only 1·72 in the controls. Diluted in 100–120 parts water, soap-stock gave over 90 per cent. mortality.

An account is given of extension work in rural districts.

SMITH (J. H.). **Insect and allied Pests of the Papaw.**—*Qd agric. J.* **48** pt. 5 pp. 553–557, 1 pl. Brisbane, 1st November 1937.

The principal pests of papaya [*Carica papaya*] in Queensland are a Nematode and the mite, *Tetranchyus telarius*, L. Infestation by the latter is frequently worst in the spring, in relatively dry, warm weather. Control can probably be best obtained by spraying with lime-sulphur, which can be used at a concentration of 1 : 35 in winter and early spring, though a weaker solution should be used in warm weather to avoid injury to the foliage. A sulphur dust is, perhaps, less effective, but is more easily applied on a large scale, especially in hilly country. Where infestation is severe, more than one application of either treatment may be necessary to give adequate control. The fruits are damaged by *Dacus ferrugineus*, F. (*Chaetodacus tryoni*, Frogg.) and fruit-sucking moths, the commonest of which are *Othreis fullonia*, Cl. (*fullonica*, L.) and *Eumaenas salaminia*, Cram. The Coreid, *Amblypelta lutescens*, Dist., the Pentatomid, *Nezara viridula*, L., and larvae of the yellow peach moth, *Dichocrocis punctiferalis*, Gn., attack both the fruit and growing points. Jassids are occasionally numerous enough to cause partial or complete leaf failure, and may seriously affect the vitality of the plant.

PAPERS NOTICED BY TITLE ONLY.

[ZIMIN (L. S.).] **Зимин (Л. С.). Les pontes des acridiens. Morphologie, classification et écologie.** [*In Russian.*]—*Tabl. anal. Faune URSS* no. 23, 107 pp., 6 figs., 10 pls., 35 refs. Leningrad, Inst. zool. Acad. Sci, 1938. Price 5 *rub.*

FENTON (F. A.). **How to control Grasshoppers in Oklahoma.**—*Bull. Okla. agric. Exp. Sta.* no. 233, 12 pp., 5 figs. Stillwater, Okla., November 1937. [*Cf. R.A.E.*, A **26** 138–140.]

GARMAN (P.). **A Study of the Bulb Mite** (*Rhizoglyphus hyacinthi* **Banks**) [in Connecticut].—*Bull. Conn. agric. Exp. Sta.* no. 402 pp. 885–904, 3 pls., 15 figs., 39 refs. New Haven, Conn., September 1937. [*Cf. R.A.E.*, A **9** 241.]

Turner (N.) & Walden (B. H.). **Some common Household Insects** [in Connecticut] **and their Control.**—*Bull. Conn. agric. Exp. Sta.* no. 400 pp. 835–855, 13 figs., 12 refs. New Haven, September 1937.

Reeks (W. A.). **The Morphology of the Adult of** *Diprion polytomum* **(Hartig).**—*Canad. Ent.* **69** no. 12 pp. 257–264, 1 pl., 5 refs. Orillia, December 1937.

Smith (C. F.) & Knowlton (G. F.). *Macrosiphum* **Aphids infesting** *Chrysothamnus* **and** *Gutierrezia* [in Utah and adjoining areas, including one new species].—*Canad. Ent.* **69** no. 12 pp. 269–272, 26 figs. Orillia, December 1937.

Deshpande (V. G.). **A preliminary Account of the Aphididae of Poona.**—*J. Bombay nat. Hist. Soc.* **39** no. 4 pp. 740–744, 3 refs. Bombay, December 1937.

Isaac (P. V.). **The biological Control of Insect Pests** [a popular account].—*Agric. Live-Stock India* **7** pt. 6 pp. 685–691, 1 pl. Delhi, November 1937.

Beeson (C. F. C.). **New** *Crossotarsus* **(Platypodidae, Col.).**—*Indian For. Rec.* (N. S.) Ent. **3** no. 3 pp. 45–103, 1 pl. Delhi, October 1937. Price 3*s.* 3*d.*

Saito (S.). **On the Development of the Tusser,** *Antheraea pernyi* **Guérin-Meneville, with special Reference to the comparative Embryology of Insects.**—*J. Fac. Agric. Hokkaido Univ.* **40** pt. 2 pp. 35–109, 11 pls., 4 figs., 160 refs. Sapporo, November 1937. [*Cf. R.A.E.*, A **22** 472.]

Watanabe (C.). **A Contribution to the Knowledge of the Braconid Fauna of the Empire of Japan.** [Revision, including 30 new species.]—*J. Fac. Agric. Hokkaido Univ.* **42** pt. 1 pp. 1–188 + iv, 5 pls., 217 refs. Sapporo, November 1937.

Knight (H. H.). *Idatiella* **China : Two new Species, with a Key (Hemiptera, Miridae)** [including *I. albisignata*, sp. n., on apple in New Zealand].—*Ann. Mag. nat. Hist.* (11) **1** no. 1 pp. 25–27. London, January 1938.

[Yakhontov (V. V.).] **Яхонтов (В. В.). Ed. Pink Bollworm** [*Platyedra gossypiella*, Saund.] **in foreign Literature.** Parts I & II. [*In Russian*; including a bibliography of 613 titles (pp. 104–165).]—*Inform. Byull. Obzor inostr. Lit. Khlop.* no. 7 (56), 125 pp., illus.; no. 8 (57), 166 pp., illus. Tashkent, 1937. Price 5 *rub.* each.

Hering (M.). **Die Blatt-Minen Mittel- und Nord-Europas.** [The Leaf-mines of Central and North Europe (final part comprising addenda, corrigenda and indices).]—Lief. 6, pp. i–viii + 561–631. Neubrandenburg, G. Feller, 1937. Subscription Price *M.* 9 per Lieferung; separately *M.* 13·5. (In Germany and Switzerland *M.* 12 & *M.* 18.) [*Cf. R.A.E.*, A **25** 637.]

Silvestri (F.). **Insect Polyembryony and its general biological Aspects.**—*Bull. Mus. comp. Zoöl. Harvard* **71** no. 4 pp. 469–498, 4 pls., 9 pp. refs. Cambridge, Mass., August 1937. [Recd. 1938.]

Mansour (K.). **The Problem of the Nutrition of Wood-eating Insects.**—*C. R. XIIe Congr. int. Zool. Lisbonne 1935* **1** pp. 233–241, 32 refs. Lisbon, 1937. [*Cf. R.A.E.*, A **22** 478.]

Eidmann (H.). **Biologie und wirtschaftliche Bedeutung der Blattschneiderameise** *Atta sexdens* **L.** [The Biology and economic Importance of the Leaf-cutting Ant, *A. sexdens*, L., in Brazil].—*C. R. XIIe Congr. int. Zool. Lisbonne 1935* **3** pp. 2295–2332, 6 figs., 2 pls., 24 refs. Lisbon, 1937. [*Cf. R.A.E.*, A **23** 750; **24** 472.]

Zacher (F.). **Eine neue Gruppe von Insektiziden.** [A new Group of Insecticides (the oxides and carbonates of magnesium, copper, zinc, etc.).]—*C. R. XIIe Congr. int. Zool. Lisbonne 1935* **3** pp. 2336–2340. Lisbon, 1937. [*Cf. R.A.E.*, A **17** 641; **18** 664.]

Goux (L.). **Notes sur les Coccides (Hem.) de la France (20e note). Diaspine nouvelle constituant un genre nouveau** [*Duplaspis fraxini*, gen. et. sp. n., on *Fraxinus excelsior*].—*Bull. Soc. ent. Fr.* **42** no. 16 pp. 229–231, 8 figs. Paris, 1937.

Goux (L.). **Notes sur les Coccides (Hem.) de la France (21e note). Description d'un** *Phenacoccus* **nouveau graminicole et remarques sur quelques espèces décrites antérieurement.**—*Bull. Soc. ent. Fr.* **42** no. 17 pp. 253–256, 5 figs. Paris 1937.

Andersen (K. T.). **Die Lupinenblattrandkäfer** *Sitona griseus* **F. und** *S. gressorius* **F.** [The Lupin Leaf Weevils, *S. grisea* and *S. gressoria* (in Germany).]—*Z. angew. Ent.* **24** pt. 3 pp. 325–356, 16 figs., 23 refs. Berlin, November 1937. [For briefer account see *R.A.E.*, A **25** 729.]

Voelkel (H.) & Klemm (M.). **Die wichtigsten Krankheiten und Schädigungen an Kulturpflanzen im Jahre 1937.** [The chief Diseases of and Injuries to cultivated Plants in 1937 (including numerous records of insects in various parts of Germany).]—*Beil. NachrBl. dtsch. PflSchDienst.* **18** no. 1, 28 pp., 3 graphs, 66 maps. Berlin, January 1938.

Morstatt (H.). **Bibliographie der Pflanzenschutzliteratur. Das Jahr 1936.** [A Bibliography of Plant Protection Literature in 1936.]—Imp. 8vo, iv + 392 pp. Berlin, P. Parey, 1937.

Hoffmann (C. C.). **Entwicklung und Stand der angewandten Entomologie in Mexico.** [The Development and Status of applied Entomology in Mexico.]—*Arb. physiol. angew. Ent. Berl.* **4** no. 4 pp. 280–291. Berlin, 15th December 1937.

de la Barreda (L.). **Las plagas en la casa del campesino. Manera de combatirlas.** [Pests in the Countryman's Home. Measures against them. (A popular account of household and garden pests in Mexico.).]—88 pp., 37 figs. Mexico, Inst. Biotécnico, 1937.

IMPERIAL INSTITUTE OF ENTOMOLOGY.

LIBRARY LACUNAE.

The Institute will be greatly indebted to readers who may be able to supply any of the following, which should be sent to the Assistant Director, Imperial Institute of Entomology, 41, Queen's Gate, London, S.W.7

RECORDS OF THE EGYPTIAN GOVERNMENT SCHOOL OF MEDICINE (CAIRO): Vol. I.
PHILIPPINE JOURNAL OF SCIENCE (MANILA): Vol. I (1906) No. 10.
REVISTA DE AGRICULTURA DE PUERTO RICO (SAN JUAN):
Vols. I (1918) Nos. 1–2; II (1919) Nos. 5–6; III (1919) Nos. 3–4; VIII (1922) No. 2; IX (1922) Nos. 5–6; X (1923) Nos. 1, 5, 6.
Indices to Vol. VI–XVI.
REVISTA CHILENA DE HISTORIA NATURAL (SANTIAGO): Año XIV (1910) Nos. 4–6; XV (1911) Nos. 1 and 3 to end; XVI, XVIII, XXVI (1912 1914, 1922).
REVISTA DE VETERINARIA E ZOOTECHNIA (RIO DE JANEIRO):
Annos I–II (1911–12). Anno III (1913) Nos. 1 to 3, and 5.
LA REVUE DE PHYTOPATHOLOGIE APPLIQUÉE (PARIS): Tome I Nos. 22–23 (April-May, 1914).
RHODESIA AGRICULTURAL JOURNAL (SALISBURY):
Vol. I Nos. 1, 3–6; II Nos. 2–4; III Nos. 1, 2, 6; IV No. 4; V No. 4 (1903–08); VII (1909–10) Nos. 1 & 6; IX (1912) No. 5; X (1912) No. 1. Title pp. and indices to Vols. I–V, VII, VIII, X.
RIVISTA DI PATALOGIA VEGETALE (FLORENCE): Vols. VII–X (1899–1904).
SCIENCIA MEDICA (RIO DE JANEIRO): Annos I–II (1923–24).
SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY:
Report, 1879–84.
TENNESSEE AGRICULTURAL EXPERIMENT STATION (KNOXVILLE):
10th (1897), 12th (1899), and 16th (1903) Annual Reports.
TENNESSEE STATE BOARD OF ENTOMOLOGY (KNOXVILLE):
Bulletin: 15, 24, 25, 28, 29, 34, 39.

LIBRARY LACUNAE—*cont.*

TEYSMANNIA (BATAVIA) : 32ste Jaarg. (1921) 10e Afl.
DE THEE (BUITENZORG) : 6e Jaarg. (1925) No. 1.
TIJDSCHRIFT OVER PLANTENZIEKTEN (WAGENINGEN) :
Jaarg. I (1895) and XVI-XVII (1910–11).
TIMEHRI : THE JOURNAL OF THE ROYAL AGRICULTURAL AND COMMERCIAL SOCIETY OF BRITISH GUIANA (DEMERARA) :
Third Series, Vols. I Nos. 1–2 ; II No. 2 to end ; III Nos. 2 to end ; IV–V (1911, 1913–18).
UNITED STATES DEPARTMENT OF AGRICULTURE (WASHINGTON, D.C.) :
Howard (L. O). Report of the Entomologist, 1895.
VIRGINIA : AGRICULTURAL EXPERIMENT STATION (BLACKSBURG, Va) :
Bulletins 24, 61 (1893–96). Technical Bulletin 8 (1915).
VIRGINIA : 1ST ANNUAL REPORT OF THE STATE INSPECTOR FOR SAN JOSÉ SCALE, 1896–97 (Richmond, Va., 1897).
4th Report of the State Entomologist and Plant Pathologist (Richmond, Va., 1905).
WEST INDIAN BULLETIN (BARBADOS) : Title-page & Index to Vol. IV.
ZEITSCHRIFT FÜR DAS LANDWIRTSCHAFTLICHE VERSUCHSWESEN IN ÖSTERREICH (Vienna) : 21. Jahrg. (1918) Hefte 1–3 & 10–12.

NOTICES.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Institute are requested to communicate with the Assistant Director.

The Annual Subscription, *in advance*, to the Review, Series A (Agricultural), is 30s. post free ; Series B (Medical and Veterinary), 15s. post free. Subscriptions to the *current* Volume received after 30th June in each year will be charged at the published price *viz.:* Series A, 36s. ; Series B, 18s. Prices of Back Volumes on application.

Orders and subscriptions should be sent direct to the Assistant Director, Imperial Institute of Entomology, 41, Queen's Gate, London, S.W.7, or through a bookseller.

CONTENTS.

CONTENTS—*cont.*

CONTENTS—*cont.*

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE
by the South Essex Recorders, Ltd., High Road, Ilford.

(664) Wt. P9/3656 1700 4/38 S.E.R. Ltd. Gp. 353.